ELECTRIC RAILWAY JOURNAL

PUBLISHED EVERY SATURDAY

McGRAW PUBLISHING COMPANY

239 W. 39th St., New York City.
Branch Offices: Chicago, Cleveland, Philadelphia, London.

Vol. XL. **AUGUST 17, 1912** No. 7

Subscription: U. S. and Mexico, $3.00
Canada $4.50
Other Countries . $6.00

SEMINARY ROOM
MECHANICAL ENGINEERING

Save a Day Going to the Chicago Convention

of the American Electric Railway Association and American Electric Railway Manufacturers' Association, by taking the

NEW YORK-CHICAGO SPECIAL—the Official "AERA" Convention Train over the NEW YORK CENTRAL LINES

NEW YORK CENTRAL LINES

SCHEDULE

Saturday October 5th

Lv. GRAND CENTRAL TERMINAL, NEW YORK	2.00 p.m.
Ar. ALBANY	5.25 p.m.
Lv. BOSTON (B. & A. R.R.)	11.30 a.m.
Lv. WORCESTER	12.40 p.m.
Lv. SPRINGFIELD	2.05 p.m.
Lv. PITTSFIELD	4.05 p.m.
Lv. ALBANY	5.30 p.m.
Lv. SCHENECTADY	6.03 p.m.
Lv. UTICA	7.40 p.m.
Lv. SYRACUSE	9.05 p.m.
Lv. ROCHESTER	10.45 p.m.
Ar. BUFFALO	12.35 m'd't

Sunday, October 6th

Ar. CHICAGO (L. S. & M. S. Ry.)	11.30 a.m.

NEW YORK CENTRAL LINES

A representative of the Passenger Department will accompany the party to look after the details and comfort of the passengers, and to reserve accommodations for the return trip.

Every comfort and convenience known to modern travel will be provided.

For details of train arrangement and other information address :

W. V. LIFSEY, General Eastern Passenger Agent **1216 Broadway, New York**

or any of the

TRANSPORTATION COMMITTEE.

C. C. CASTLE, Superintendent of Arrangements, U. S. Metal & Mfg. Co., 165 Broadway, New York.
W. H. SAWYER, Chairman, with Ford, Bacon & Davis, 115 Broadway, New York.

COMMITTEE FOR NEW ENGLAND STATES

M. C. BRUSH, Second V.-P., Boston Elevated Ry. Co., Boston.
C. C. PEIRCE, Dist. Mgr., Ry. Dept., General Elec. Co., Boston.
W. S. MURRAY, E.E., N. Y., N. H. & H. R.R., New Haven.
H. E. REYNOLDS, A. G. M., Bay State St. Ry. Co., Boston.

COMMITTEE FOR NEW YORK STATE (Outside New York City)

W. K. ARCHBOLD, President, Archbold-Brady Co., Syracuse.
C. E. BARRY, Railway Dept., General Electric Co., Schenectady.
J. K. CHOATE, Gen. Mgr., Otsego & Herkimer R.R. Co., Hartwick.
W. H. COLLINS, Gen. Mgr., Fonda, Johnstown & Gloversville R.R.
E. J. COOK, V.-P., New York State Railways, Rochester.
J. C. CALISCH, V.-P., Buffalo & Lake Erie Traction Co., Buffalo.

COMMITTEE FOR NEW YORK CITY.

CHAS. C. CASTLE, United States Metal & Mfg. Co., 165 Broadway, New York.
THOS. FARMER, Jr., V.-P. Consolidated Car Heating Co., 149 Broadway, New York.
W. J. HARVIE, Railway Manager, J. G. White & Co., 43 Exchange Place, New York.
S. W. HUFF, Pres. and Gen. Mgr., Coney Island & Brooklyn R.R. Co., DeKalb and Franklin Aves., Brooklyn, N. Y.
GEO. KEEGAN, Gen. Supt., New York Rys. Co., 165 Broadway, N.Y.
J. H. McGRAW, Pres. McGraw Publishing Company, New York.
T. F. MULLANEY, Chief Engineer, Third Avenue Ry. Co., 130th St. and Third Ave., N. Y.
S. W. TRAWICK, Dist. Mgr., Ry. Dept., General Electric Co., 30 Church St., N. Y.

Alphabetical Index and Classified Directory sixth page following text

Educational

"JOE," said the General Manager to his Master Mechanic, "my attention has been called to this Westinghouse HL control instruction book, indicating that the're a lot of detail parts that require expert mechanics to look after.—How about it?"

Joe, smiling, replies, "That's wrong dope, boss; that instruction book is a real instruction book, not an advertisement. It's educational and instructive, and tells how to take care of the apparatus. As far as HL control being delicate, etc., that's all bosh. Our records for the past year show only three failures on 25 city cars, or 238,000 miles per control failure, and these were due to light contact on the master switch drum."

Master Controller.

"All right, Joe," said the General Manager, "I just wanted to get straight on that part."

Unit Switch Group HL Type.

Westinghouse Electric and Manufacturing Co.

Sales offices in 45 American Cities

East Pittsburgh, Pa.

Electric Railway Journal

A CONSOLIDATION OF STREET RAILWAY JOURNAL AND ELECTRIC RAILWAY REVIEW

Vol. XL NEW YORK, SATURDAY, AUGUST 17, 1912 No. 7

PUBLISHED WEEKLY BY

McGraw Publishing Company

JAMES H. McGRAW, Pres. C. E. WHITTLESEY, Sec'y and Treas.

239 West 39th Street, New York

TELEPHONE CALL: 4700 BRYANT. CABLE ADDRESS: STRYJOURN, NEW YORK.

CHICAGO OFFICE.....1570 Old Colony Building
CLEVELAND OFFICE.....1021 Schofield Building
PHILADELPHIA OFFICE.....Real Estate Trust Building
EUROPEAN OFFICE....Hastings House, Norfolk St., Strand, London, Eng.

TERMS OF SUBSCRIPTION

For 52 weekly issues, and daily convention issues published from time to time in New York City or elsewhere: United States, Cuba and Mexico, $3.00 per year; Canada, $4.50 per year; all other countries, $6.00 per year. Single copies, 10 cents. Foreign subscriptions may be sent to our European office.

Requests for changes of address should be made one week in advance, giving *old* as well as new address. Date on wrapper indicates the month at the end of which subscription expires.

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to Wednesday, 9 a m., of the week of issue.

Copyright, 1912, by McGRAW PUBLISHING COMPANY.
Entered as second-class matter at the post office at New York, N. Y.

Of this issue of the ELECTRIC RAILWAY JOURNAL, 8000 *copies are printed.*

NEW YORK, SATURDAY, AUGUST 17, 1912

CONTENTS.

Public Demand for Subways..... 237
Economical Substation Operation..... 237
Safety and Cleanliness in the Shop..... 238
Investment to Relieve Congestion..... 238
Air-Bound Feed-Water Heaters..... 238
Obsolescence in Cars..... 239
Cincinnati Traction Company Shop Practice..... 240
Forced-Draft Ventilation of Conduit Run in Brooklyn..... 244
British Columbia Electric Railway Track Reconstruction on Granville Street, Vancouver, B. C..... 245
New Light Signal Installation on the Terre Haute & Eastern..... 247
New Third-Rail and Contact Shoe System of Philadelphia and Western Railway..... 248
Columbus Shop Notes..... 250
The St. Louis Center-Entrance Trail Car..... 251
Compilation of Public Utility Laws..... 252
Trial Trip of New York Double-Deck Car..... 253
Special Truck Frame Milling Machine Used by Cleveland Railway.. 253
Third Avenue Railways Specification for Rubber-Insulated Cable for D. C. Service..... 254
Operating Records of Brooklyn Center-Entrance Car..... 254
Meetings of the Committee on Standards..... 254
Chicago and Cleveland Franchise Settlements..... 255
Program of International Electrical Congress..... 256
Painting Steel Bridges and Structures..... 257
Bushing Air Compressor Cylinders at Richmond..... 258
Steam Supply for Shop Service in Summer..... 258
Combination Motor Truck for New Haven..... 258
Commutating-Pole Rotary Converters..... 259
News of Electric Railways..... 260
Financial and Corporate..... 261
Traffic and Transportation..... 264
Personal Mention..... 266
Construction News..... 267
Manufactures and Supplies..... 270

PUBLIC DEMAND FOR SUBWAYS

We have no doubt that the settlement of the subway question in New York and the decision to make an extensive addition to the city subways will stimulate the demand for subways throughout the country. The resident of Podunk on his return from a short visit to the metropolis will wonder why the Podunk Rapid Transit Company does not also install at least a short length of subway under its most traveled street and will begin an agitation in favor of its immediate construction. In larger cities there will undoubtedly be an even more accentuated demand for underground transportation, and meetings engineered by real-estate interests will urge its necessity. Elevated railways will not suffice. They are not good enough for New York and should not be tolerated in these modern days. It may be something of a surprise to those who bring forward this latter argument to know that more than one-half of the miles of route composing the proposed "subway" extensions in New York by both the Interborough Rapid Transit Company and the Brooklyn Rapid Transit Company are not really subways but are to be elevated railways, and that when the additional third tracks on the present elevated railway which form part of the proposed plans are included, the proportion of elevated structure to underground structure will be a much greater ratio. Generally speaking, it costs five times as much per mile of track to build a subway as it does to build an elevated railway, and the elevated railway can handle just as much traffic. Subways of any length are financially possible only in the largest cities.

ECONOMICAL SUBSTATION OPERATION

Improvements in the efficiency of substation operation are being sought more and more in connection with the closer study of distribution systems for electric power supply. In the selection of machinery the predetermination of loads is being carefully considered, since upon the variations in hourly demands upon motor-generator sets, transformers and rotary converters depends much of the economy of the installation as a whole. At best a substation involves substantial losses in energy conversion or costly switching and measuring devices, and sometimes all three. There is certainly room for investigation in connection with the relation between heating limits and loads carried both inside and outside the substation building. Thus many cables which distribute energy for commercial services are able to carry 20 per cent higher loads for the same heating limit in winter than in summer, but in most cases this is a little-used advantage in carrying the peak load of the entire year. Recent practice shows also that the substation operator may find some of the features of economical steam engineering helpful, notably in connection with the cooling of circulating water for transformer service in artificial ponds and in home-made towers of little cost. In one instance the water consumption of a 9000-kw substation was greatly decreased and the temperatures within the transformers were cut about 20 deg. for the same loads by this simple method.

SAFETY AND CLEANLINESS IN THE SHOP

Among master mechanics it is a saying that the number of armatures in the electrical shop is a good index of maintenance conditions on a railway. It is not so generally appreciated, however, that the method of disposing of general waste and scrap also offers an indication of the degree of efficiency. Few modern mill rooms are without an exhaust system for sawdust and shavings, but how many electrical shops have taken the same precaution to confine metallic dust and filings to harmless channels? The catch-all of the carpentry shop has found wide adoption because it is clearly a means to obviate the great danger of fire. On the other hand, it is not usually considered that a similar scheme for the electrical department would prevent freshly varnished coils from picking up stray metal chips with short-circuiting tendencies and reduce the danger of injury to the eyes of the workmen from flying particles. One of the large Eastern railways has succeeded in eliminating all troubles from this source by connecting its commutator slotter so that the cuttings are drawn into the exhaust piping system of the mill room and by hooding the lathe on which the babbitted bearings are bored. The babbitt filings fall directly into a box below the lathe and are returned to the crucible before they can entrap any grit or other scoring substances. The same shop also contains a furnace into which all waste and discarded wiring are thrown before they can accumulate. This practice has the merit of keeping the shop clean, of saving time and of preventing the theft of much valuable scrap.

INVESTMENT TO RELIEVE CONGESTION

It is interesting to note that the great influx of investment money into the electric railway industry is directed at present toward the increase of urban rapid transit facilities in the most congested city of the country. The additional subway development planned on so large a scale for Greater New York is possible, however, only because there has been a complete stoppage of construction for several years. If a normal amount of mileage had been added during each of the years between the opening of the present subway of the Interborough Rapid Transit Company and the execution of the new subway contracts, the investment of new capital would have been made so gradually as to have comparatively little effect on the investment markets. While some of the additions to mileage proposed for the two principal New York companies will serve outlying districts, the main investment will be in the congested centers of the large city and will therefore be dependent for sustaining revenue, not on the development of unsettled territory, but on service rendered in localities where the density of natural traffic is high and the amount of short distance riding is enormous. Increase in density of population and corresponding increase in density of business population progress at a very rapid rate on Manhattan Island because the only way in which the demand for home and business space can be met is by the construction of buildings of greater heights. Conditions of this character offer the most profitable of all fields for urban railway operation, for they provide a subway right-of-way unimpeded by ordinary street travel in a district of great and constantly increasing congestion.

AIR-BOUND FEED-WATER HEATERS

The very general tendency toward the use of the open feed-water heater during recent years is a logical result of the many satisfactory features inherent in its design. The practical elimination of the necessity for frequent cleaning, the ease with which deposits of scale and mud can be removed, the limited opportunity for breakdowns and the lack of necessity for repairs, together with high operating efficiency, all contribute to the favor with which it is regarded and make it a thoroughly desirable and even necessary piece of apparatus for every power plant. It is, however, subject under certain conditions to become "air-bound." When this condition arises, the heater simply fails to deliver hot feed-water although everything about it is working satisfactorily.

The trouble, as a rule, occurs during periods of light loads. It is caused by a collection of air in the heater which isolates part or all of the incoming feed-water from the exhaust steam. Naturally any air which collects in the heater soon becomes cold, and its almost perfect insulating qualities prevent any possibility of the transmission of heat through it. In consequence the efficiency of the heater is greatly impaired, and as all exhaust steam holds in suspension a small amount of air which has been driven off from the boiler, this, together with the air thrown off by the heating of the raw feed-water, has a decided tendency to collect in the heater at all times.

During periods of heavy load the rush of entering exhaust steam agitates the contents of the heater to such an extent that any air which may tend to collect is mixed up with and carried off by the steam which escapes from the vent, but at periods of light loads this agitating effect may practically disappear. This applies especially to modern heaters, operated on the "induction" principle, in which all of the exhaust is not passed through the heater, but only so much of it is drawn off from the exhaust main as the heater will condense.

All steam engineers recognize that a vent for permitting the escape of the air is the most effective means of overcoming the difficulty, but opinions differ as to where the vent hole should be located. With few exceptions, heater manufacturers place it at the top of the steam space and apparently fail to realize that both air and carbon-dioxide, which are the only two gases likely to collect in the heater, are considerably heavier than steam of the same pressure and temperature. Venting the heater through the top provides a means for the escape of steam, but unless sufficient mechanical agitation exists so that air and carbon-dioxide collecting at the water level of the heater are caught up by the current of steam and carried with it out of the vent, there is no possibility for their escape. The top vent for open heaters probably originated from a desire to reduce the number of fittings in the pipe connections and as most of the early open heaters were connected for "through" operation the arrangement did not cause any noticeable trouble. However, with the "induction" type of connections the small vent at the top may easily become insufficient to produce the necessary amount of agitation and the result is that the heater becomes air-bound. At best, the top vent causes a heavy waste of steam.

It may seem unreasonable to vent any piece of apparatus at any place except the top, but reference to a set of steam tables will establish the fact that air which separates from steam will collect below it. However, concession to conservatism may be made without a sacrifice of the principle which supersedes it, and there does not seem to be any logical reason why a vent should not be placed at the bottom of the steam chamber of a heater in addition to the usual one at the top. Such a hole can easily be drilled and tapped by the engine room force at any time. This plan has been carried out in several installations by a constructing engineer, and of them not one ever gave the slightest trouble. Up to capacities of 3000 hp both vents were made of 3-in. pipe, and globe valves near the heater were placed in both lines. By throttling these any proportion of the vented steam could be drawn from top or bottom as desired.

OBSOLESCENCE IN CARS

The radical improvements which have been made in car design during the past few years and the revolutionary types now being tried in a few cities present an interesting study to the accountant as well as to the engineer. The latest cars of this kind, like the low-entrance cars and double-deck cars, are admittedly experimental, and their full worth for different classes of traffic is by no means determined. But if we assume that the low-entrance car or the double-deck car, or both, should prove so successful as a traffic promoter in any particular instance as to earn their cost of construction within a short time, how shall they be paid for?

One manager of whom this inquiry was recently made said: "If the car is as successful as we expect that it will be, we can afford to scrap all of the other cars which we have and adopt the new type exclusively." Such a situation would be a repetition, on a somewhat smaller scale, of the condition of affairs twenty years ago when the change was made from horse and cable to electricity. At that time it was evident that the greater earning power of the electric system was sufficient to earn the interest both on its own cost and the amount at which the discarded equipment stood in the capital account. Hence the change was made lightheartedly, and the old horse cars were sold for what they would bring as summer cottages and chicken coops, with no thought in most cases of modern theories of reserve funds to take care of obsolescence. If the companies in the early nineties had been obliged, either by their stockholders or by anyone else, to keep their capital charges against equipment at approximately the physical value of that equipment, and to charge up annually against the electric equipment not only its own cost of operation and maintenance but a fixed sum to retire within a few years the difference between the operating value and the scrap value of their horse cars, barns and rails, the situation would have been entirely different. The new electric equipments would have appeared on the books as much more expensive in first cost than at that time they seemed to be, the improvements would have been delayed, and street railway passengers in many cities would probably have jogged along for many years behind horses in the old-fashioned way.

This, however, is a matter purely of history. The present problem is how to take advantage of this past experience in any modern instance of obsolescence, if any lesson is to be learned. This much is evident, that if the capital account is to remain an exact or close reflection of the assets, tangible and intangible, the account representing cars should not include both cars in operation and cars that have gone out of use, and new equipment must be charged with the duty not only of paying interest on its own cost but of retiring within a fixed number of years the difference between the operating value and the second-hand value of the equipment which it replaces.

There is still another phase of the question which should be borne in mind if we assume the rigorous application of this method of accounting and a demonstrated success of low-entrance cars in city service. This is that unless the old-style cars can be adapted to the new designs at not too great an expense or a use can be found for them elsewhere, they will become relatively less valuable, and hence will be subject to a greater rate of depreciation from obsolescence than in the past, whether a company should adopt the new type of car or not. It may seem a little strange at first to think that the capital value of property is subject to a varying rate of depreciation depending upon what others may do with similar property in a different locality, but an analogy is found in prime movers in power stations. Before the introduction of the turbine a new power station equipped with reciprocating engines could be valued for operating purposes at its replacement cost with the same type of engines. But after the demonstrated success of the turbine a new reciprocating engine plant would be worth for power generation purposes only the amount for which it could be replaced by a cheaper turbine plant having the same capacity and operating economy.

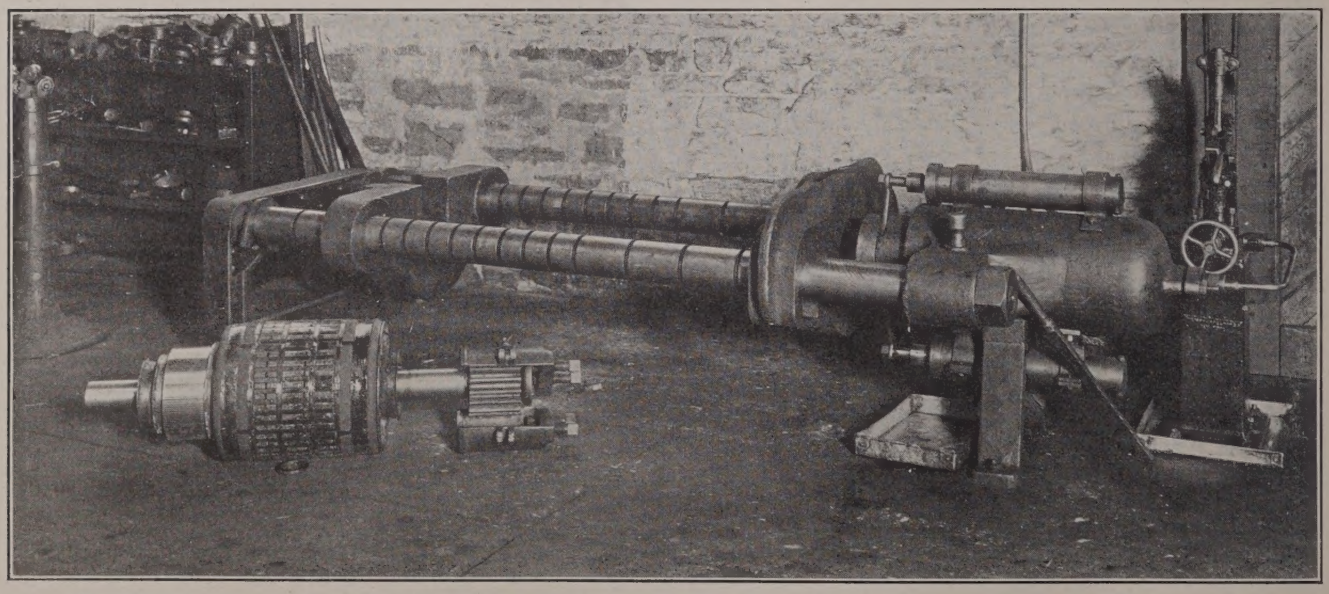
These remarks are published not for the purpose of discouraging invention. Improvements are bound to be made by enterprising managements, and any effort to stay their progress would be futile even if it was advisable. Where a change can be made in equipment on any road which will pay all elements of its cost it will be made sooner or later. But it is equally futile to shut one's eyes to the effect upon the capital account of possible changes in the art, and it will be especially unfortunate if those authorities who establish rates and determine the rate of return to be earned by railway enterprises do not take into consideration this uncertain element in electric railway investments. Anyone who assumes that the electric railway methods and apparatus in use to-day are bound to remain standard and that the equipment is subject to no more depreciation than that which it undergoes from wear deceives himself, and may do a great deal of harm if he should deceive others. It is by no means certain that either the low-entrance car or the double-deck car is radically to change current American electric railway practice. But they may, just as the pay-as-you-enter idea has effected a radical change in methods of car design, and if they do not, there will be other changes later just as great which may seriously affect the value of the investment. This is one of the hazards which investors in electric railway enterprises must take and one of the reasons why they are entitled to more than a "savings-bank" return.

Cincinnati Traction Company Shop Practice

Equipment and Methods Employed in the Armature-Winding Department—Electric-Welding Outfit and Other Helpful Shop Apparatus

The Cincinnati Traction Company's armature and coil-winding department has as complete an equipment as will be found on any railway in the country. Owing to the severe conditions under which the motors are required to operate on this property it was necessary to equip the armature department for any emergency. As is generally known, Cincinnati is built on the bluffs along the north side of the Ohio River, and practically all lines lead from the business district on the lower level of the bluffs to the residence district on the upper level. In several cases the grades are so steep that it was necessary to resort to cable inclines. At the present time the Cincinnati Traction Company operates 850 cars in its regular service and owns 1450 cars, including all classes of equipment.

The motor repair department is situated in a separate building about 40 ft. x 80 ft. in plan, which is constructed with rubble limestone walls and a built-up wood roof. Ample light has been provided through large windows and skylights, and by whitewashing the inside walls and ceilings not only is the light more uniformly diffused but the building has been made more fireproof and sanitary. The floors are of concrete, and wooden slat mats have been provided at all benches and machines where workmen are on their feet continually.



Cincinnati Shops—Hydraulic Press and Pinion Puller in Armature Shop

The floor space has been divided into five sections, according to the class of work being handled, but only the coil-winding and curtain repair section has been separated from the others. It is inclosed by a 12-ft. wooden partition, providing a room about 25 ft. x 35 ft. The other sections consist of floor space set aside for armature winding and repair work, the coil impregnating and baking outfit, coil and armature testing sets and storage space for completed or defective armatures. The shop is served by an overhead traveling hoist, which is supplied with two differential hoists of 2 tons capacity.

ARMATURE SHOP

The armature shop equipment includes a hydraulic press of 50 tons capacity, which is employed for removing armatures and pinions from their shafts. The press is of sufficient length to remove any type of armature. The two shafts which connect the bearing end with the plunger end of the press have been grooved at close intervals so that a horseshoe-shaped stop-bearing may be inserted at any required distance from the plunger. The press is manually operated by a small hand pump, and the return movement of the plunger is quickened by compressed air, which forces the oil from the cylinder to the reservoir. Compressed air at 100 lb. pressure is furnished from a pipe system which extends through the various shop departments.

In the armature-winding section a long workbench has been constructed along one wall, beside which a sufficient number of armature-winding stands have been placed to keep four men employed. The armature-winding stands are of this company's design and consist of a cast-iron pedestal of sufficient height to bring the work up to where the men will not have to stoop. The top of the pedestal is provided with a pair of rollers on which the armature shaft is permitted to rest, thus making the work of turning the armature easier while it is being wound. A shelf about 14 in. square has been clamped to each pedestal, on which tools or coils may be placed.

On the opposite side of the armature-winding aisle another workbench and a coil-testing outfit have been provided. Field coils are tested for shorts and when found defective are prepared for the insulation removal, retaping and rewinding. In the center of the aisle in the armature-winding section is a small blast furnace which is constructed with a cast-iron shell lined with fireclay. It consists of two soldering-iron-heating ovens and a scrap-melting furnace.

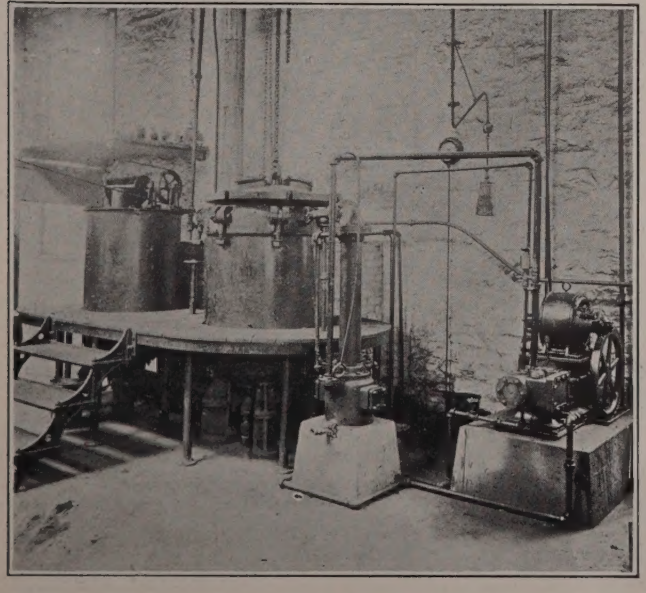
A test circuit in conduit extends along the wall just over the workbench in front of the armature winders. Lamp sockets have been installed in the test circuit at frequent intervals. Each winder is furnished with a two-wire flexible cord provided with a plug and test points for use in testing commutator bars for shorts. Two lathes have been included in the shop equipment and are used in turning commutators and banding armatures. These are operated by a

short section of motor-driven line shaft. A General Electric slotting machine has been installed and all commutators are slotted when undergoing repairs.

The armature-winding department employs four winders constantly, and in an eight-hour day they do all the repair

Cincinnati Shops—Armature-Winding Section

work and rewinding for the 850 cars. For the severe conditions under which the cars on the Cincinnati Traction lines operate the force is comparatively small, and the excellent service obtained from repaired armatures is credited to a rigid inspection system. The winders make their own tests before placing a completed armature in the shop stock, and the assistant foreman makes the final test. All new work is tested at 2500 volts and all repair work at 1500 volts. All new armature work is paid for on a piece basis and the company requires that it must stand up in regular service ninety days or the workman who did the winding will be required to repair it on his own time. All armatures,



Cincinnati Shops—Impregnating Outfit

after being rewound, are dipped and rolled in a shallow tank filled with Sterling black plastic and they are then placed in the oven and baked until the plastic has thoroughly dried.

COIL-WINDING SECTION

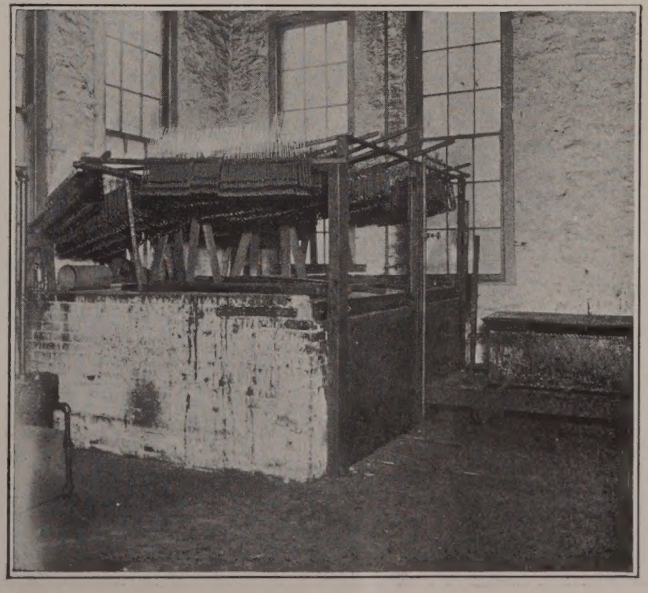
The equipment in the coil-winding section consists of three taping machines installed on the table shown in the illustration below. These machines take any sized coil and are driven by a line shaft incased in a sheet-metal cover under the table. The operator controls the machine by means of a foot-lever friction clutch. On the opposite

Cincinnati Shops—Coil-Winding Department

side of the table a coil-winding machine has been installed, which is driven from the same line shaft. This machine takes any style of coil form and is also controlled through a foot-lever friction clutch.

The steam-heated coil presses have been installed on a workbench along one wall of the coil-winding section. Three of them are manually operated by means of set screws, and one is operated by air at 100-lb. pressure, which is controlled by a small engineer's air valve.

The work in the coil-winding department also includes the cleaning and repairing of curtains. Every car which comes into the shop for general repairs has its curtains



Cincinnati Shops—Baking Oven and Dipping Tank

cleaned, repaired or renewed. The curtain material, which includes pantasote used in closed cars and awning duck used in open cars, is purchased in large quantities. Two power-operated sewing machines are installed for use in the manufacture of curtains. The working force in the coil-winding department consists of four girls and one man.

The girls wind and tape coils and do all the curtain work. The average output is about 120 armature coils of any type in an eight-hour day.

IMPREGNATING OUTFIT AND BAKING OVEN

An impregnating outfit and a coil-baking oven are shown in one illustration. The former was manufactured by the Buffalo Foundry & Machine Company. The coil-baking oven is of the company's design and is about 8 ft. square. It is built with brick walls and a concrete slab top and is provided with two counterbalanced lifting sheet-metal doors. Heat is furnished from steam pipes supported on the walls of the oven. After the armature coils have been through the impregnating process they are redipped and put in the oven for baking. Field coils are redipped and baked three times before they are considered to be in suitable condition for service.

Cincinnati Shops—Welding Bumper by Electricity

To facilitate the redipping a tank has been placed on a steel truck so that it may be run into the oven over a short section of track, where the liquid may be reheated. The tank has been provided with a water-sealed cover which is placed in position when the liquid is reheated. The oven is put in service only when there are sufficient coils on hand to fill it. After the coils have been removed from the oven they are placed on a rack, where they are permitted to dry naturally before they are put in the general storehouse stock.

INSULATION-REMOVING, RETAPING AND REWINDING MACHINE

Probably no other machine in the armature department saves the company as much money as the insulation-removing, retaping and rewinding machine, which is shown in the illustration on this page. This machine was designed and built by the mechanical department and is used in reclaiming wire from short-circuited field coils. The defective field coil is placed on the reel shown at the right of the illustration below. The coil wire is given three turns around a large wheel which is slightly grooved and provided with a foot brake which, when applied, holds the wire taut as it passes through the insulation-removing and rewinding machines. In the insulation-removing machine the insulation is crushed between two rollers before it passes through two crotch-shaped scrapers which remove it. This machine

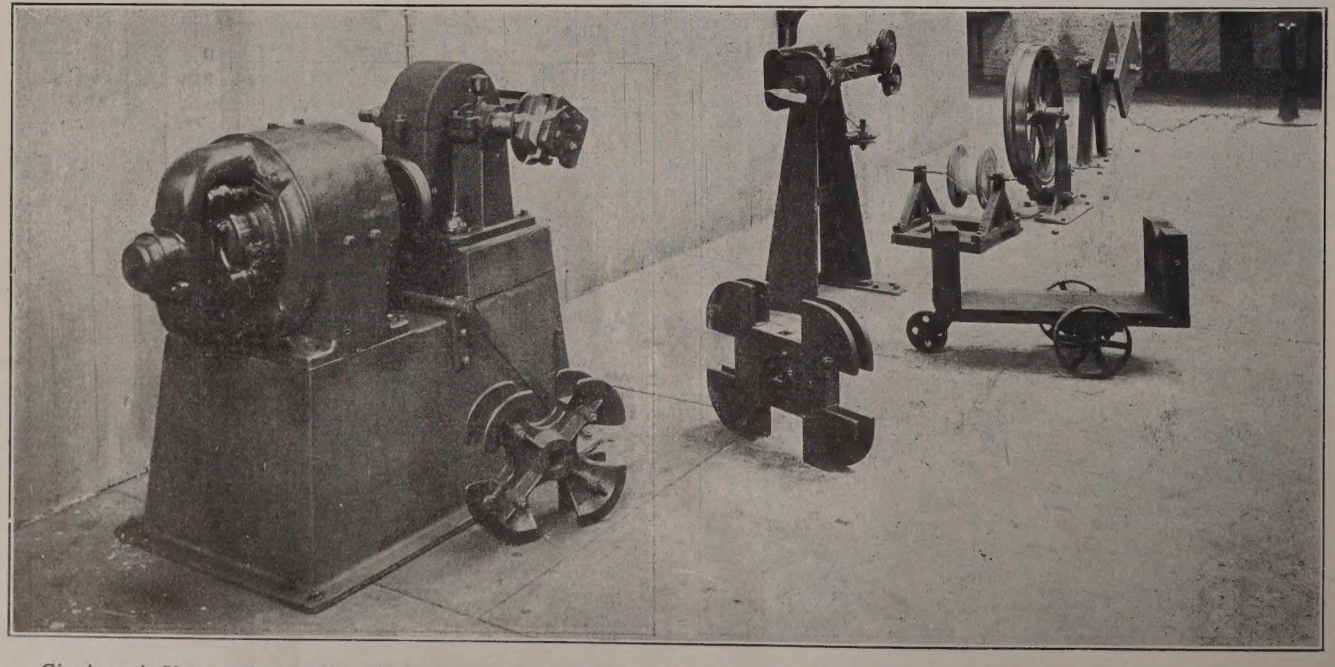
THE CINCINNATI TRACTION COMPANY.

Armature No. .....

NATURE OF WORK.	WORK DONE BY	DATE
Coils Wound		
Insulated		
Taped		
Armature Wound		
Connected		
Banded		
Tested		

.....Foreman.

Cincinnati Shops—Daily Labor Record Form



Cincinnati Shops—Insulation Removing, Retaping and Rewinding Machine, Forms for Coils and Armature Truck

also retapes the wire as it passes to the rewinding machine at the left of the illustration.

A 7½-hp, 550-volt d.c. motor, which is made a part of the rewinding machine, furnishes the power necessary for the complete operation. A cut-out switch and rheostat installed on the wall convenient to the operator controls the energy supply and speed of the motor.

ACCOUNTING FOR LABOR AND MATERIAL

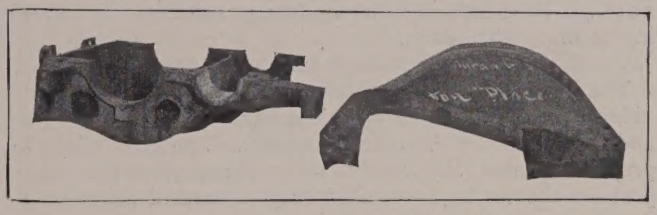
As new work is paid for on a piece basis, it was necessary to devise a method of fixing the responsibility for each set of coils wound. Each workman is provided with small brass tags stamped with his working number. When a set of coils has been completed one of these brass tags is taped in the insulation. The coils continue to bear this tag until they are used, and then a record is made of the tag number and armature on which the coil was used.

The foreman of the armature shop is made responsible for all material furnished by the store department and has to sign a receipt for it. The record of labor is filled out daily by the coil and armature winders and checked by the foreman, who is furnished with a duplicate copy for his own record. A sample blank of this kind is reproduced on page 242. The payrolls are made up from the daily labor record forms after the value of any coils or jobs which fail to pass inspection is deducted.

GENERAL SHOP NOTES

A portion of the machine shop provides space for an electric arc welder, which was designed and built by the traction company's mechanical department. The welding outfit is shown in the illustration on page 242 and consists of a section of heavy insulated cable provided with a carbon holder, and the bedplate of a high-speed metal-cutting circular saw is employed as a work table. The bedplate has been insulated from its foundation and is connected to the return circuit. The carbon holder is attached to a section of ¾-in. heavily insulated cable. Two sizes are employed, depending on the size of the weld. The opening through which the carbon passes is provided with a slotted and tapered bushing, which is inserted in the holder with the small end away from the work, so that when the carbon is pressed against the work it wedges itself in the holder. Four sizes of carbon are employed—⅜-in., ¼-in., ¾-in. and 1-in. A circular piece of "transite" board has been placed on the holder just back of the carbon clamp so as to protect the workman's hands from the intense heat. A sheet-metal helmet with a green-glass eyepiece is used to protect the workman's eyes and face from the intense light and heat when welding. In order to protect the eyes of the other workmen in the shop a 5-ft. sheet-metal screen has been placed on three sides of the electric welding outfit.

Current is furnished at 90 volts and 500 amp and the rack shown in the illustration contains sufficient resistance to vary the amperes from 50 to 500. The resistance circuits have been arranged so that they are controlled by ten knife switches which cut out 50 amp each. The current flows from the table to the carbon, but the direction of flow may be reversed in case the surface being welded is to be used for a wearing surface, which requires no machine work. The reversing of the current flow causes an increase in the amount of carbon deposited with the iron filings and iron used in welding, thus increasing the hardness of the welded metal.



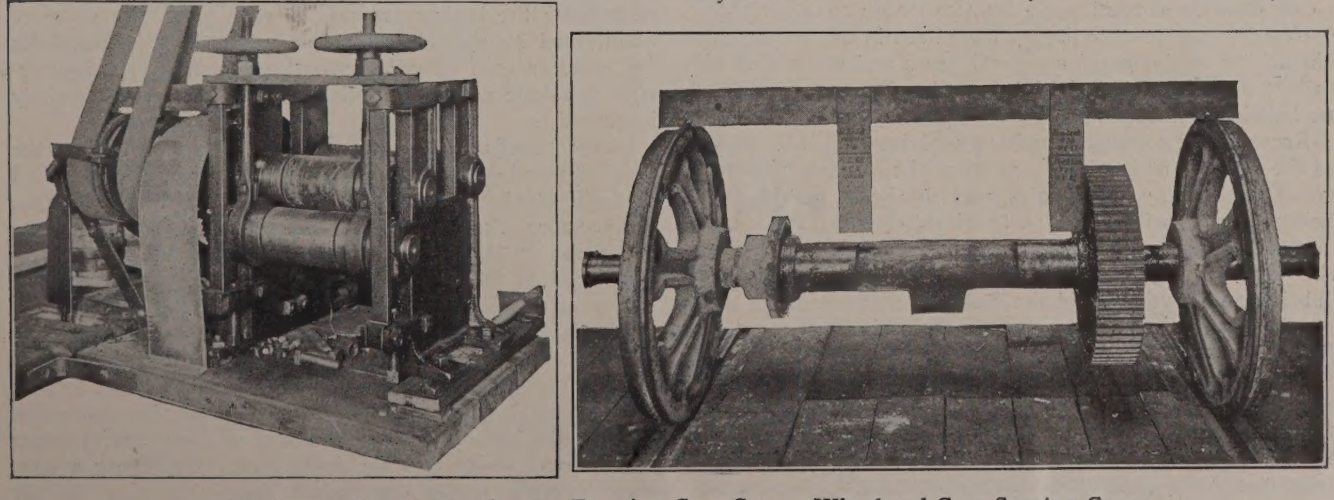
Cincinnati Shops—Standard Sheet Metal Gear Case and Yoke, and Motor Case Showing Weld through Bearing

When the parts to be welded are large, such as motor shells, truck frames, large axles and shafts, a gas-heating attachment is employed to bring the metal up to a red heat, thus materially reducing the current consumption. The gas attachment consists of a T-shaped section of ¾-in. pipe provided with couplings and valves on two legs, to which the compressed air hose and gas hose are attached, and a third leg consisting of a mixer and burner. The attachment acts like a Bunsen burner in that the gas and air may be adjusted to obtain a flame of maximum heating quality.

The welding outfit is served by a jib crane of 2 tons capacity and is beneath the 40 ft., 5-ton traveling crane which serves the machine shop.

To give an idea of the work that the electric welder is doing a short list of the work done is furnished. Castings are welded of all kinds, such as motor cases, gear cases and truck frames. Axles and shafts are built up so that they can be turned down to correct size. The axle welds are made only when the break is not over 4 in. from the end. Welds have been made on 8-in. axles, and the mechanical department says that there has never been a weld failure.

The electric welding is done by a machinist who soon became an expert, but others have been broken in to relieve him when necessary. The intense light and heat have a very detrimental effect on the eyes and skin if directly exposed and workmen must become able to avoid them. It requires from three to three and a half hours to weld a 4-in. axle or a motor shell broken at the axle bearing.



Cincinnati Shops—Machine for Forming Gear Cases—Wheel and Gear-Spacing Gage

SHEET-METAL GEAR CASES

The Cincinnati Traction Company has standarized all

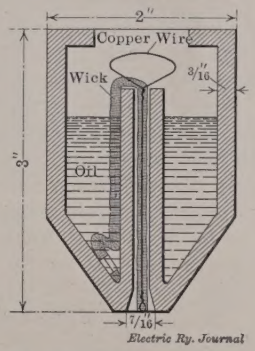
gear cases and is now manufacturing them of 10-gage sheet steel. The standardization has been accomplished by the employment of a cast-steel yoke made to fit any size of motor shell. The standard gear case yoke and the machine employed in forming and flanging the curved sides of the case are shown in two illustrations on page 243. The gear case is formed and riveted and all joints are electrically welded. The mechanical department records show that considerable saving has been made by the use of the standard gear case when compared with the malleable case. Sheet steel gear cases have been in service over two years and none has been broken either by being crushed or by breaking at the welded joints.

WHEEL AND GEAR CHECKING GAGE

The foreman of the machine shop has experienced considerable trouble in getting the workmen to locate the gear and car wheels on the axle accurately. The gear might be properly located, but when the car wheels were pressed in position the workmen would not give careful attention to the spacing between the car wheel and the gear. This has been overcome by making a wheel and gear gage, shown in an illustration on page 243, for every type of truck in service. The gage is of wood and is therefore light and cheap. The type of truck is plainly stamped on each gage, and since the workmen know their work can be checked easily, the accurate spacing of gears and wheels on the axles receives more careful attention.

MANUAL PINION PULLER

The Cincinnati Traction Company's mechanical department has designed and manufactured a cast-steel pinion puller which is novel and efficient in service. The pinion puller is shown in position in the illustration of the hydraulic press on page 240. The puller consists of a two-piece cast cylindrical shell with a reinforced lip on one end, against which the pinion bears when being removed. The other end is heavily reinforced so as to provide a sufficient number of threads for the four set screws which are clamped against a flared block which rests on the end of the armature shaft. The whole device does not weigh over 10 lb. and is amply strong to remove any motor pinion.



Cincinnati Shops—Capillary Oiler

CAST-IRON ARMATURE BEARINGS AND MOTOR AXLE LININGS

Cast-iron motor axle linings have been in use on the Cincinnati car equipment for several years and are giving excellent results. No special lubricant has been employed and no babbitting is required.

Recently the company has been applying cast-iron sleeves to the bearing ends of the armature shafts as fast as they come in the shop for repairs, and the brass bearings are being replaced with cast-iron bearings, thus making a cast-iron-on-cast-iron bearing surface. The sleeve is shrunk on the armature shaft and eliminates the dust ring. No special lubricant is required, and the fact that no perceptible wear can be noted after eight months' service indicates that the life of the bearing will be considerably in excess of that received from ordinary brass bearings and that the quantity of oil required will be materially reduced. The fact that the cast-iron bearing does not require a babbitt lining, as well as the difference between the cost of brass and cast iron, materially reduces the cost of manufacture and maintenance.

CAPILLARY OILER

When the oiled waste in the armature-shaft oil cups is replaced by the capillary oiler illustrated on this page the quantity of oil required is materially reduced and heated bearings are practically unknown. The capillary oiler consists of a gray cast-iron shell the details of which are shown. Plain motor oil is supplied to the reservoir, and the wick is manufactured from the best quality of worsted yarn. The reservoir end of the wick is held in the oil by a lead weight, and the other end is forced through the oil-feed duct to the bearing area by a short piece of twisted copper wire. The copper wire also acts as a conductor of heat from the bearing to the oil, thus eliminating the oil coagulation which might be expected in the duct.

TROLLEY-STAND REPAIRS

On many electric roads a badly worn trolley-pole bearing means the renewal of the bearing and pin. But at Cincinnati a method of repair has been devised which eliminates this necessity. The worn trolley-stand bearings are reamed out and the pin turned down until it is true. This provides sufficient space to insert a set of ¼-in. case-hardened cold-rolled steel rods which have been turned true, thus making a roller bearing out of a plain bearing. The bearing is inclosed by a large washer and stud bolt screwed in the top of the trolley bearing pin. This method of repair provides not only a better bearing but one that requires less attention and oil.

FORCED-DRAFT VENTILATION OF CONDUIT RUN IN BROOKLYN

The Williamsburg power station of the Brooklyn Rapid Transit System, being situated adjacent to the gas works of the Brooklyn Union Gas Company, has experienced considerable inconvenience from gas accumulating in its high-tension duct runs and manholes and in the basement of the station. On many occasions the accumulation of gas has been such that the cable splicers were unable to remain in the manholes for more than fifteen minutes at a time.

In order to prevent the possibility of explosions, which would result in a serious interruption to the service of the railway, a forced-draft system of ventilation has been installed in the power station, consisting of a 5-hp Sirocco blower set, which is capable of delivering 6100 cu. ft. of air per minute against a total pressure of 1½ in. With this blower set it is now possible to keep the duct runs, manholes and station basement entirely free from gas. No further trouble is experienced by the cable men, as work can be carried on in the manholes for any length of time.

Under normal conditions it is necessary to maintain a pressure of only ¾ in., requiring less than 2 hp at the blower. However, when the ground is frozen and covered with snow the higher pressure is required. The pressure maintained by this blower set is appreciable in manholes for a distance of ¾ mile from the station. By using air-tight manhole covers this distance can be very materially increased.

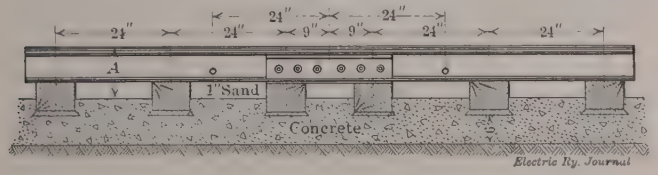
Other beneficial features of this scheme are that the manholes and ducts are always dry, and that by the use of air-tight manhole covers the manholes will be kept clean; furthermore, the temperature of the cables is lowered at the point in the transmission system where the highest temperatures are most likely to occur; that is, where the duct runs accommodate the greatest number of cables.

The layout of the duct runs at the Williamsburg power station is such that the forced-draft ventilating scheme could very conveniently be applied, because the high-tension cable ducts from the manholes pass through the storeroom office in the basement of the building in four separate runs of two ducts wide and six ducts high. By laying a concrete flooring across the top of these duct runs an air chamber was formed, into which the blower discharges. Openings were cut into each conduit, these openings being staggered so that the possibility of a cable failure would not communicate to the next adjacent cable. The station end of each duct was closed by filling in around the cable with a weak mixture of cement, so as to prevent the air discharging into the station basement.

British Columbia Electric Railway Track Reconstruction on Granville Street, Vancouver, B. C.

A Description of the Methods and Equipment Employed in Reconstructing 2600 Ft. of Double Track Originally Laid in Concrete in Twenty-Four Days

Granville Street, Vancouver, is a principal business street over which six car lines pass, or about 150 cars per hour. The tracks on Granville Street between Robson and Drake Streets, a distance of ½ mile, were riding so badly that their reconstruction was imperative. It was not advisable to rebuild during operation and, as there is a double-track car line only two blocks away, the Board of Public Works



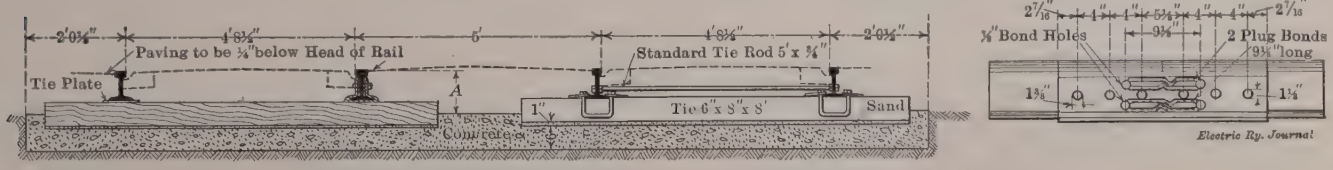
Vancouver Track—Longitudinal Section

granted the British Columbia Electric Railway Company permission to abandon traffic during reconstruction, provided that it was restored in twenty-four days.

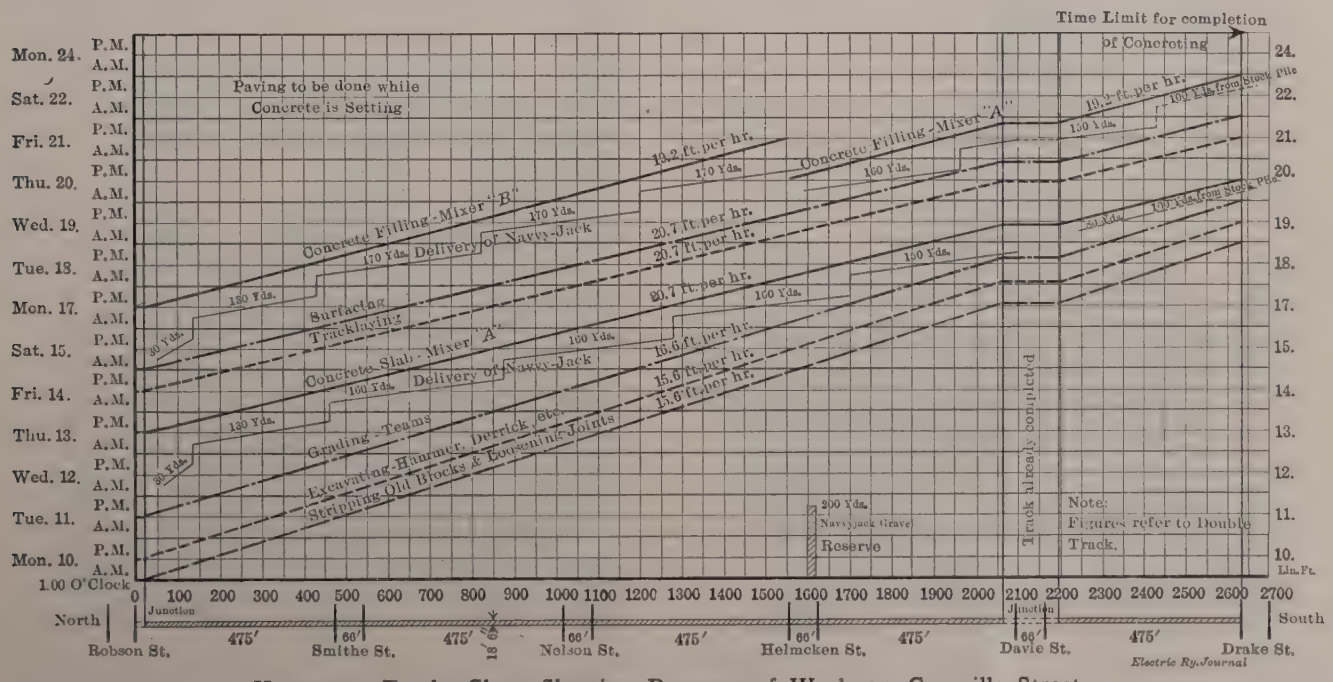
The street was paved originally with wood blocks laid on 6 in. of concrete, and each rail of the double track was carried on a concrete girder 24 in. wide and 15 in. deep. 6-in. x 8-in. x 8-ft. ties, spaced 2 ft. center to center. The track is surfaced to grade on a sand cushion averaging 1 in. deep, and the concrete is brought up to the under side of the pavement. Tie rods are spaced 24 in. from each joint, and the tie rods between these rods are spaced equally, ten rods being used to a rail length. By reference to the cross-section it will be seen that the bottom of the concrete slab is 20 in. below the top of the rail grade.

The reconstruction of the tracks on Granville Street required the removal of the following quantities: 5100 sq. yd. of wood block paving, 10,200 linear ft. of rail or 5100 linear ft. of single track, 1800 cu. yd. or 5100 sq. yd. of concrete foundation and 600 cu. yd. of earth. This material was replaced with 2400 cu. yd. of concrete, ½ mile of double track, 850 sq. yd. of granite flangeway blocks and 4250 sq. yd. of wood blocks.

As the concrete must set ten days before traffic can be turned back on the street, it was necessary to complete the work outlined, except the paving, in twelve days, and not fourteen days, as two Sundays intervened. The reconstruction was pursued day and night, and a schedule was prepared showing the rate of progress which must be made



Vancouver Track—Cross-Section and Detail of Bond Drilling



Vancouver Track—Chart Showing Progress of Work on Granville Street

Owing to the nature of the foundation these girders were not heavy enough to carry the weight imposed upon them, and on account of this the company adopted the type of construction shown in the illustrations. This type consists of a 6-in. concrete slab laid over the entire track allowance, 18½ ft. wide, upon which 91-lb. T-rail 7 in. high is laid on

on each of the operations in order that the work should be finished within the time limit. This schedule was so closely followed that everything except the paving was done one hour before the time specified. During the ten days the concrete was setting the street was repaved so that when traffic was restored all the work was completed.

The British Columbia Electric Railway Company had a large construction force employed on the greater portion of its work, which assured it that the proposed speed in the various operations could be realized with the exception of that specified for breaking up the concrete. The company had just built a piece of new track which called for the removal of about 300 sq. yd. of concrete of a similar nature and laid by the same contractors. This piece of concrete was removed by hand, and it required fifteen men six days to accomplish the work. As the schedule called for the removal of about 32 sq. yd. of concrete per hour, it was seen that some mechanical means must be used, and the following scheme was adopted:

Vancouver Track—Laying Final Concrete

Vancouver Track—Ready for Pavement

The dipper arm was taken off the electrically driven Thew automatic shovel owned by the company, and pile-driver leads about 20 ft. long were hung from the end of the boom, being held in position by two braces running back to the main frame of the shovel. A hammer weighing 2600 lb. with a wedge-shaped cutting edge about 8 in. deep running parallel to the track was specially cast. The cutting edge was placed this way in order not to injure the remaining concrete in the street. This scheme worked excellently, and no trouble whatever was found in breaking up the concrete as rapidly as it could be taken away.

The concrete breaker, which could swing through 360 deg., was placed on one track, and the derrick car was placed on the other track. The derrick car had a 60-ft. boom which could also swing through 360 deg. and was self-propelled. The latter car was used to break up the larger pieces of concrete and load them on flat cars placed behind the concrete breaker. It was used also to unload skips in which were placed the smaller pieces of concrete and earth, this material being dumped into wagons standing alongside. The concrete breaker and derrick car backed

Vancouver Track—Concrete Breaker and Derrick Car

Vancouver Track—Breaking and Loading Concrete

up on the old track as soon as the concrete was broken up for a rail length ahead of them.

The price of common labor was $3 per day of ten hours, and teams received $8 per day shift of ten hours and $9.50 for night shift. The average haul for teams was ¾ mile

Vancouver Track—Complete Work

and for the track cars about 2 miles. The cost of the work was as follows:

Digging up wood blocks, 8.9 cents per square yard.
Tearing up old track, 11 cents per foot of single track.
Breaking up concrete, 40 cents per square yard, or $1.13 per cubic yard.
Excavation, loading and dumping, 82½ cents per cubic yard.
Removing material by teams and work train, 65 cents per cubic yard.

G. R. G. Conway, member American Society Civil Engineers, is chief engineer of the British Columbia Electric Railway Company, and the work was carried on under the supervision of C. B. Vorce, member American Society Civil Engineers, engineer of construction, assisted by H. J. Tippet, engineer maintenance of way, and A. J. Kennedy, roadmaster.

NEW LIGHT SIGNAL INSTALLATION ON THE TERRE HAUTE, INDIANAPOLIS & EASTERN

A new installation of automatic block signals with light indications for both day and night use was inspected on Aug. 7 by the Indiana Railroad Commission and others. The party included Judge W. J. Wood, chairman of the commission; Commissioners J. F. McClure and Frank E. Payne; Arthur W. Brady, president Indiana Union Traction Company; R. I. Todd and G. K. Jefferies, respectively president and general superintendent Terre Haute, Indianapolis & Eastern Railway; C. D. Emmons, general manager Chicago, South Bend & Northern Indiana Railway; M. H. Hovey, consulting signal engineer of the commission and safety service expert for the Wisconsin Railroad & Tax Commission; Chief Inspector Scott, of the Indiana Commission; Professor Gorman, of Purdue University, who is the commission's inspector of interlocking, and W. H. MacFadden, foreman in charge of the installation.

The party left Indianapolis about 9:30 a. m. on a special car and inspected the part of the system which was in operation. This comprised the signals controlling the block at the east end of the installation, which extends from Greencastle to Brazil, a distance of about 15 miles.

Light signals are used throughout this installation. They are placed so as to protect the single-end sidings which are standard on the Terre Haute, Indianapolis & Eastern Railway. There are but three indications, these being "stop," "proceed" and "proceed prepared to stop short of any obstruction in the block." The stop indication is a red light, the proceed indication a green light and the caution indication a red light surmounting a yellow light.

A car entering a block leaves behind it a red and yellow light for following movements and sets up a single red light at the opposing end of the block for opposing movements. Thus an opposing car gets a stop signal and a following car gets a signal to proceed under control. The signals are normal danger, the red light burning continuously except when a car is in the preliminary clearing section. In order to reduce power consumption a low candle-power light is used for the normal indication, but when a train is in the block the red lights for the stop and caution signals are equipped with high candle-power lamps.

Block indicators are used for conveying information concerning the condition of some of the blocks. These indicators are only to be observed when the next siding is a meeting point, and each indicator consists of a lamp which is fastened to a trolley pole at the point desired to be marked. When the lamp, which gives a white light, is burning the indication means that the opposing train has entered the block in advance and that if the train approaches the siding it will not delay that opposing train. The meaning of this is "proceed to the siding." When the light is not burning it indicates that the opposing train has not entered the block in advance and that to proceed would result in delaying or interfering with the proper movement of that opposing train. The absence of the light in the block indicator, therefore, is really a stop signal, and the method of operation provides that a train stopped by a block indicator should wait a predetermined time and then the crew should call up the dispatcher and be governed by his orders.

Switch indicators are installed at the siding switches. These indicators each have a red blade which is pivoted at the center and stands normally in the vertical position. When it is desired to let a car out of a siding the conductor observes the indicator, and if the blade is vertical opens the switch, which puts the blade in the horizontal position. After the switch has been opened the conductor is required to press a button in the indicator case so that he may ascertain from the position of the blade whether or not a train is in the block which he desires to enter. If there is a train in the block the blade will stay in the horizontal position, but if the block is clear it will go to the vertical position when he presses the button. A time element has been introduced into some of these switch indicators which operates to prevent a train from passing out of a siding at the same time that another train is entering the block. After the conductor opens a switch and presses the button an interval of fifteen seconds elapses before the blade will go to the vertical position, provided there is no train in the block.

A test was made to determine how far the stop aspect is arrestive, and it was found that the red light was very plainly discernible at a distance of over 2000 ft. There was a light drizzling rain at the time the test was made, and the background of the signal was such that the aspect was visible at a considerably greater distance than a semaphore would have been.

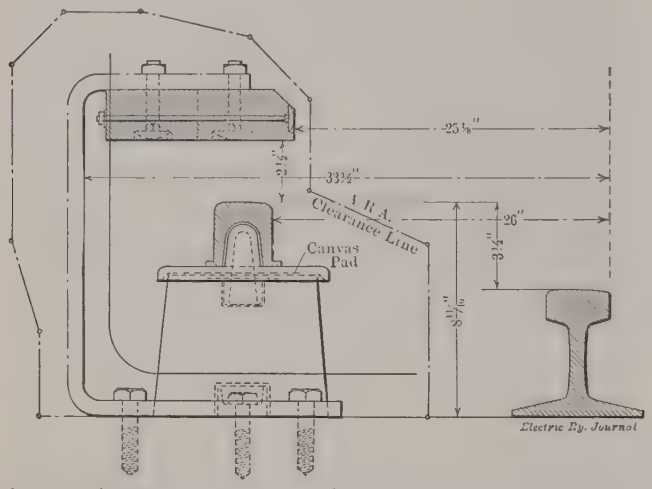
On account of the fact that the installation was not fully completed the commission made another inspection during the week of Aug. 12.

An installation of light signals on the Indiana Union Traction system will be inspected by the commission in the near future. This installation is similar in all respects to the one on the Terre Haute, Indianapolis & Eastern with the exception that double-end sidings are used. The signal systems on both roads are being installed by the General Railway Signal Company and are composed of its latest improved apparatus.

New Third-Rail and Contact-Shoe System of Philadelphia & Western Railway

Details of an Economical Under-Contact Third-Rail System with a New Type of Automatic Shoe

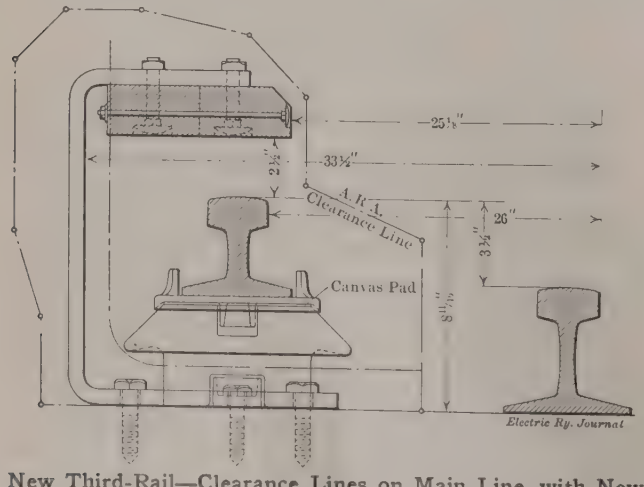
The Philadelphia & Western Railway recently found itself confronted by the necessity either of rehabilitating the under-contact third-rail which had been originally installed and was of U shape or of using some other type. The decision had to be hastened because of the fact that the company was about to build 6½ miles of double track as a final link of the system over which the trolley cars of the Norristown Transit Company and the Lehigh Valley Transit Company would enter Philadelphia, so that an exceptional opportunity was offered for changing over the entire line at the lowest ultimate cost. A decision was finally made in favor of the top-contact rail hereinafter described.



New Third-Rail—Clearance Lines on Branch Lines Where Original Contact Rail Has Been Reversed

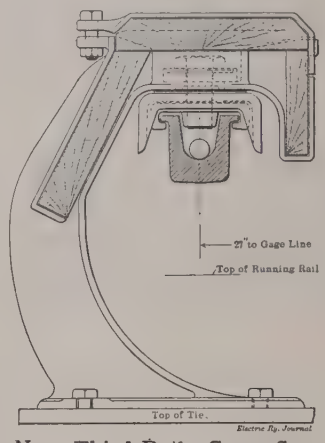
CONDITIONS TO BE SATISFIED BY NEW THIRD-RAIL SYSTEM

The features which had to be embodied in a system of contact-rail current collection were as follows: Reduction of first cost and maintenance, elimination of leakage losses, increase in clearance, automatic operation of the shoes.



New Third-Rail—Clearance Lines on Main Line, with New Section of Conductor Rail

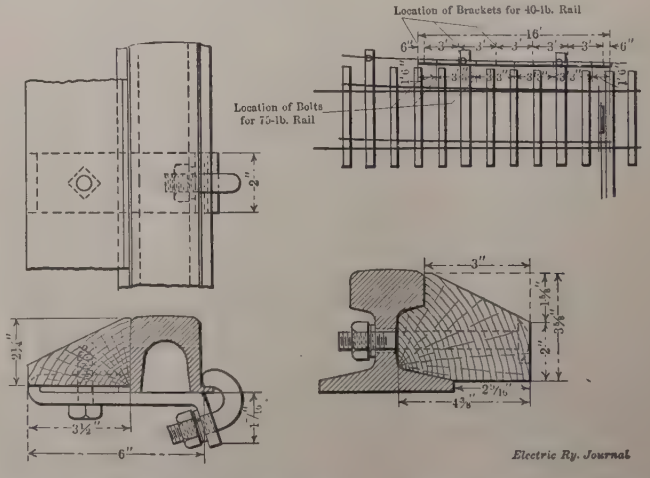
It was found possible to design a top-contact third-rail at a much lower cost than that of the original pattern. Before the company finally decided upon this form, however, it made a careful cost comparison of catenary construction and of the various types of third-rail systems in use throughout the country. It was found that for approximately 17 miles of double track the simplified third-rail system (using part of the old material) could be installed for about $100,000 less than catenary construction. The cost of the new shoes, hereinafter described, is about one-half the cost of the original type.



New Third-Rail—Cross-Section of Old Contact Rail

Experience had shown that while the original under-contact rail provided for longitudinal movement due to expansion and contraction, no provision had been made for movement in a vertical plane. The vibrations set up by heavy cars brought such enormous strains upon the insulators that in many places the only insulation left was that afforded by the tie. Furthermore, it was found very difficult to locate these defective insulators.

As to clearances, it was desirable that the tracks of the Philadelphia & Western Railway, which are built in accordance with the highest steam railroad standards, should also be able to take the various types of steam railroad freight cars. Sufficient clearances for this purpose could not be obtained with the existing under-contact rail. The clearances of the new rail, as shown on this page, etxend beyond the clearance line specified by the American Electric Railway Association and the American Railway Association. In fact, they are ample to take care of all classes of rolling stock except a few types of the hopper-bottom cars usually referred to as "battleships."

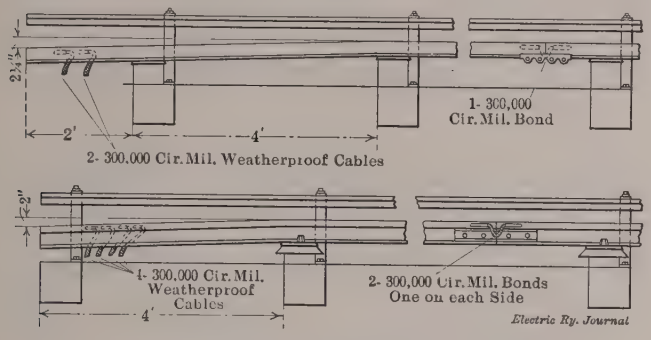


New Third-Rail—Side Inclines for Crossing from One Rail to Another

As to the change in the shoe, the automatic folding and unfolding feature was a necessity, owing to the agreement for interchange service with the Norristown Transit Com-

pany. The Norristown Transit cars operate with an overhead trolley on their own lines, and it was essential to have the interchange from third-rail to overhead trolley effected without danger or any loss of time. It is especially desirable that the shoes on such cars should be folded when the cars are operating on overhead trolley wire and on city streets, as their projection beyond the clearance lines of the car is likely to lead to accidents. It would not be desirable, of course, to fold the shoes by hand.

In view of the acknowledged superiority of the covered under-contact rail from the standpoint of protection against sleet trouble and safety to employees, it was also


1- 300,000 Cir. Mil. Bond
2- 300,000 Cir. Mil. Weatherproof Cables
4- 300,000 Cir. Mil. Weatherproof Cables
2- 300,000 Cir. Mil. Bonds One on each Side
Electric Ry. Journal

New Third-Rail—End Inclines and Bonds

felt that the same advantages must be embodied in the new top-contact rail.

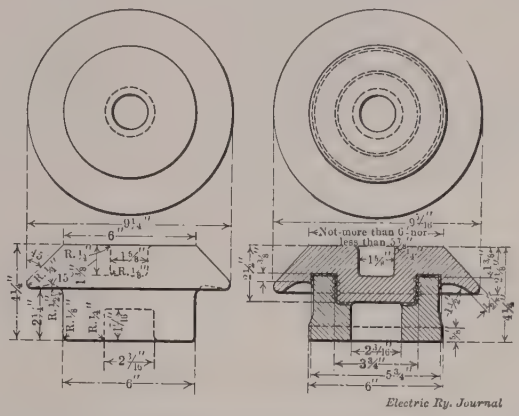
DETAILS OF NEW THIRD-RAIL

The new third-rail system as now installed in accordance with the designs of H. S. Farquhar, general manager and chief engineer Philadelphia & Western Railway, has two types of conductors. One is a 75-lb. T-rail used for the entirely replaced construction on the main line between West Philadelphia and Villa Nova; the other is the original special U-section which was taken off this main line and installed on the branch lines upside down, owing to the change from bottom to top-contact. These conductors are made of special steel having a conductivity of about 15 per cent of 98 per cent pure copper and are shown on page 248. They are supported at intervals of about 8 ft. on either of the two types of insulators illustrated. The block type and petticoat type of insulators furnished by the Ohio Brass Company are of the one-piece dry-process manufacture. The petticoat type is believed to be the

New Third-Rail—Bending-Down of Third-Rail at Villa Nova Junction

largest single piece of porcelain ever made of this character. This insulator is pressed from a dry clay which is practically a powder. The petticoat type of insulator, furnished by the Pittsburgh High-Voltage Insulator Company, through the Shield Electric Company, New York, is a two-piece, cemented porcelain wet-process insulator. All insulators are giving good service. The insulators are held in place on the tie by means of a cast-iron cup and lag screw, and a cast-iron cap on top of the insulator retains the rail in position.

The vibration which gave so much trouble in the original third-rail system has been obviated by an allowance for ample vertical movement and also by the insertion of a canvas pad between the cap and the insulator. This pad



New Third-Rail—Single-Piece and Double-Piece Insulators

prevents the vibration of the cars and track structure from acting directly upon the porcelain. The conductor rails are not brought down to a point at switches or other special work, the rail being merely bent down at the ends as illustrated. The rails are bonded with the electric welded bond of the Electric Railway Improvement Company, one 300,000-circ. mil bond being placed on each side of each joint of the 75-lb. conductor and one at each joint of the U-conductor. In crossing from one third-rail to another, side inclines consisting of sloped timbers placed alongside the conductor rails are provided.

Protection for track walkers and practical elimination of sleet, ice and snow troubles are insured by two 2-in. cover boards which are carried from mild steel brackets, as shown on page 248. This arrangement of cover eliminates joint plates as the joints of the boards are staggered, prevents warping and permits the cover board to be readily sprung around curves.

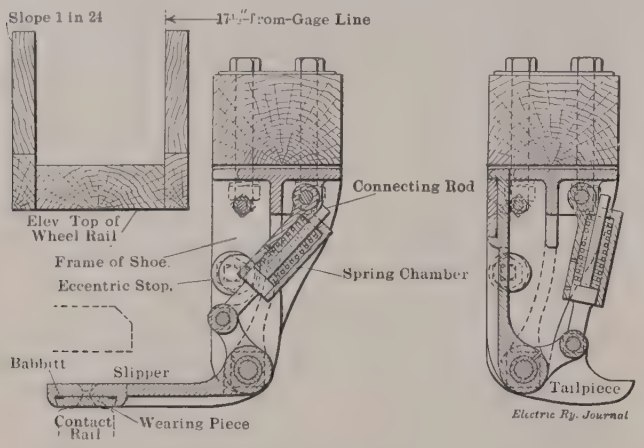
THIRD-RAIL SHOE

The construction of the self-folding top-contact shoe is shown in the sections on page 250. It will be seen that the shoe slipper is pivoted to a connecting rod, the spring of which makes the slipper bear against the contact rail with a pressure of about 10 lb. Although this is the only

New Third-Rail—Side View Showing a Joint, Bond and Insulator

spring in the shoe, it holds the slipper in both its operative and inoperative positions and has proved ample for the service. The spring is fully protected by means of the special spring chamber from becoming packed up with snow or ice, so that the annoying necessity of using burning

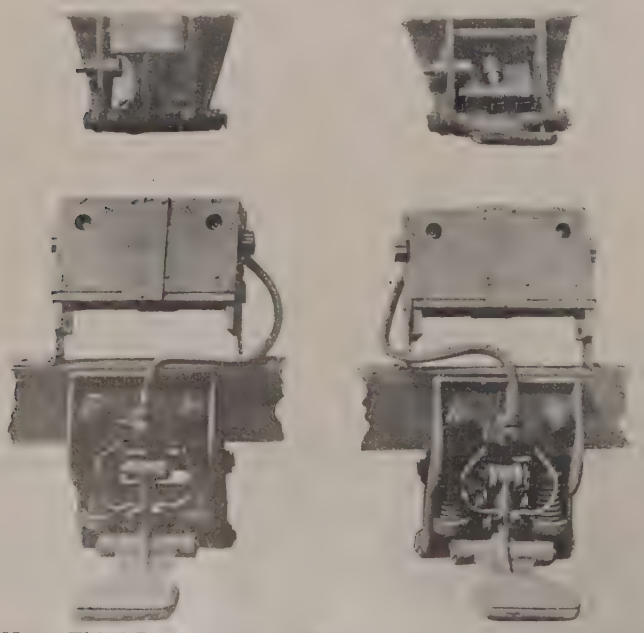
waste to thaw out any springs is obviated. The complete slipper does not bear directly on the rail, as it carries a tool-steel insert wearing piece which is retained by two rivets. When this piece is inserted, babbitt is poured into the grooves, as indicated in the section, to hold the wearing part more firmly and to give perfect electrical contact.



New Third-Rail—Automatic Shoe, Open and Closed

During the winter the slipper is slanted slightly downward in order to make contact with the far side of the third rail, as from observation this part of the rail is usually found entirely free from sleet. This is done by means of the eccentric stop, the four quarter turns of which will also take care of a 1½-in. reduction in the diameter of the car wheels. In addition to the eccentric stop there is a rack adjustment on the car trucks for raising and lowering the shoe beams.

The automatic folding and unfolding of the shoe is obtained in the following manner: Where the shoes should either open or fold, as the case may be, two parallel metal



New Third-Rail—Upper Views, New Top-Contact Shoe Closed and Open; Lower Views—Left, Under-Contact Shoe; Right, Compromise Shoe

strips which are sloped in opposite directions are placed along the tracks and set several inches apart. If the shoe is open, the slipper will bear against the rising strip until it assumes a nearly vertical position, and the spring then acts to close it. The rising of the slipper, however, is coincident with the lowering of a tail-piece which is always approximately at right angles to the slipper. When the shoe is to be opened, this tail-piece will be within the range of the other inclined strip, so that it will be forced upward while the slipper moves downward to make contact with the conductor rail. The eccentric stop and the tail-piece prevent the slipper from dropping when unsupported by the third-rail.

An effective proof of the simple construction of the new shoe is afforded by one of the accompanying half-tone views which shows the original under-contact shoe, the compromise shoe which was used during the change-over period when the shoes had to operate on both under-contact and top-contact rails, and the present automatic folding shoe in both its open and closed positions.

COLUMBUS SHOP NOTES

The Columbus Railway & Light Company, Columbus, Ohio, has a completely equipped brass foundry. It is a one-story brick building, approximately 20 ft. x 30 ft. and located about 50 ft. away from the main shop buildings. The equipment consists of two brass furnaces, molding sand bins and a sufficient number of molding flasks to keep one man employed continuously. The castings manufactured include all the brass bearings used on the line, trolley wheels, car hardware and controller contacts. The quantity of work is sufficient to employ one man continuously. One or two extra men, when required, are furnished from the main shop force. The company estimates that it is manufacturing 4-in. trolley wheels for 40 cents each, including the bushing, and 6-in. trolley wheels for 60 cents each, including the bushing.

As on many other roads, the master mechanic, Charles E. Hott, has devised a special bearing metal formula. He uses 77 per cent copper, 8 per cent tin and 15 per cent lead. The copper is placed in a crucible and allowed to reach the melting temperature, then the tin and lead are added. After all the metals have been thoroughly mixed by stirring, the mixture is poured into small pigs and allowed to cool. This process has been found to give a tough material of uniform texture whose turnings when the castings are finished are blue and not copper-colored.

The same process is used in making the babbitt metal as in the bearing metal. A mixture of 16 2-3 lb. of tin, 8 1-3 lb. of antimony and 8 1-3 lb. of copper is melted and poured into pigs and allowed to cool. When this mixture is remelted, 66 2-3 lb. of tin is added, making a total of 100 lb. of metal ready for use. The average mileage during 1911 obtained from this babbitt in GE-67 armature bearings was 45,174 miles. This average includes all bearings removed on account of accidents or other causes not due to natural wear. The GE-88 axle linings averaged 91,457 miles in the same year.

A special formula is also used for trolley wheels. It is 90 per cent copper and 10 per cent tin. A mixture consisting of 25 lb. of copper to 1 lb. of zinc is employed in the manufacture of the lugs used on switchboards.

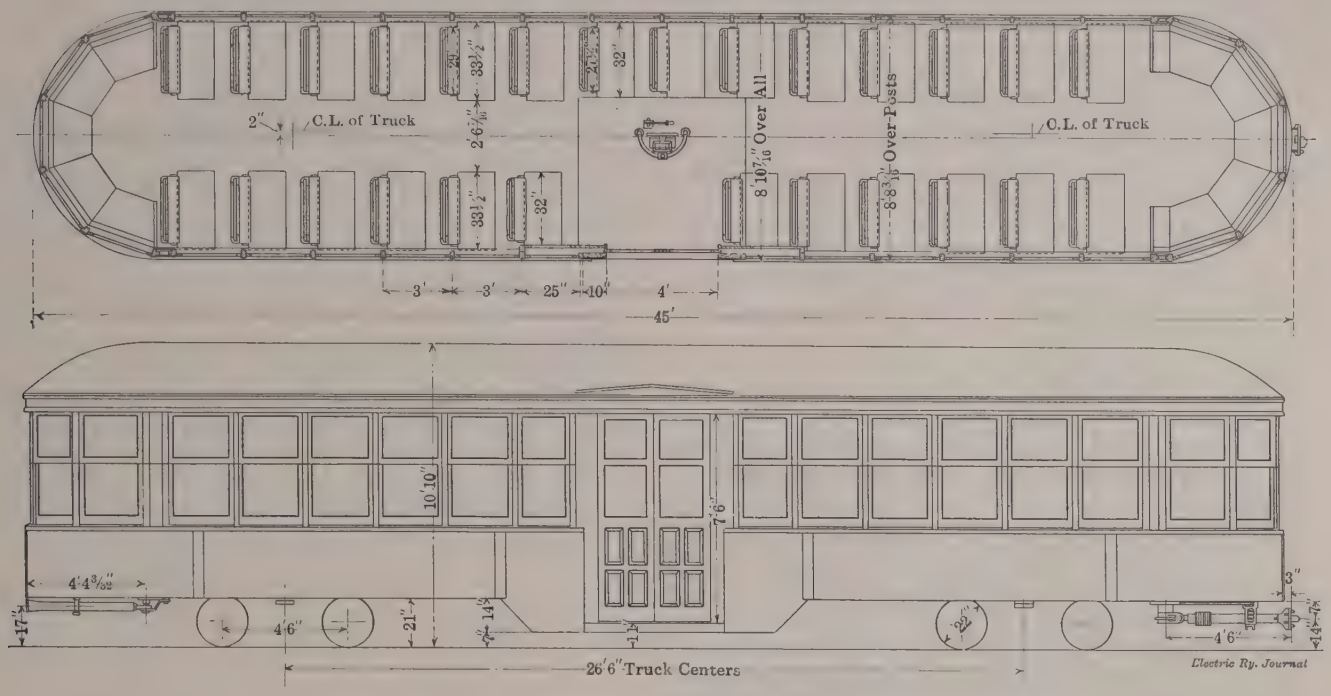
The Columbus Railway & Light Company uses chilled cast-steel wheels and is getting 73,157 miles from its 18-in. and 20-in. pony wheels and 61,563 miles from its 33-in. wheels. The GE grade D gear and pinions gave an average of 127,451 miles for the pinion and 176,201 miles for the gear during 1911. This average mileage includes all gears removed because of accidents and all other causes.

All mileage figures quoted in this article were obtained by averaging the results secured from the 440 cars which this company operates over a system with practically no steep grades. These figures are taken from records which are carefully kept.

The Louisville (Ky.) Railway has given $1,000 to a fund which is being raised to erect a citadel to be used by the Salvation Army in Louisville.

THE ST. LOUIS CENTER-ENTRANCE TRAIL CAR

A new type of trail car has recently been put into service by the United Railways Company of St. Louis. It was built in the shops of the railway company as an experiment in order to ascertain whether this type of car would prove satisfactory to the public of that city, and the experimental car has proved so successful that it has now been decided to build a number of additional cars of the same type.



St. Louis Trail Car—Elevation and Plan Showing Seating Arrangements.

GENERAL ARRANGEMENT

The car has been built with a low main floor obtained by the use of a shallow floor framing and by the use of low trucks with wheels 22 in. in diameter, generally similar to the low-floor Pittsburgh trail car described in the Electric Railway Journal for Dec. 10, 1910, page 1155. Entrance and exit are afforded by means of a single center door, opposite which is a well or depressed portion of the main floor of the car. This well, together with the reduced height of the main floor, enables the first step from the street into the car to be maintained at 11 in. The center well is unusual in that it does not extend across the full width of the car.

The seats are arranged transversely along both sides of the car, but at each end of the car a semi-circular end seat is bracketed from the end and corner posts. The seating arrangement with which the car was equipped at first was a longitudinal one throughout, but on account of the great preference expressed by the passengers these longitudinal seats were changed to the cross seats now installed, and all future cars will be equipped with cross seats. Since the well does not reach clear across the car, the cross seats extend without a break for practically the full length of the car, on the side opposite to the door.

The seating capacity is sixty-eight, although the over-all length is only 45 ft. Of the seated passengers, fifty-two are seated in the cross seats and thus face forward. In the semi-circular end seats eight passengers face sideways, four in the front of the car face backward and four in the back of the car face forward.

ENTRANCE AND EXIT FACILITIES

Passengers enter and leave the car through the single center door. This door is 4 ft. wide and is operated in halves. It gives access to the center well, which is 6 ft. long and extends in for 5 ft. 8 in. from the side of the car. The step from the street to this well is 11 in. and the height of the step from the well to the main floor at the side of the well is 12 in. There is standing space in this well for eight passengers, so that this number can be loaded, the door closed and the car started before fares are collected.

The conductor is located behind the fare box, protected by

St. Louis Trail Car—View Showing Drop-Siding and Well at Entrance Door

a semi-circular railing, and back of the fare box is an emergency hand-brake wheel set vertical in order to reduce the floor space occupied. The entrance door is opened and closed by a hand lever back of the fare box and operated by the conductor. Entering passengers pass the conductor in two streams, one toward each end of the car, and fares are collected at this point. Signals for starting and stopping the motor car which hauls the trailer are provided by means of an electric bell circuit from the trailer conductor's stand to the conductor's booth on the motor car.

CONSTRUCTION.

The car has a steel underframe and steel siding 1/8 in. thick extending as high as the belt rail. The siding is carried around the semi-circular ends of the car and no bumper beams are provided, the spacing between the front end of the trailer and the rear of the motor car being maintained by the automatic couplers. The underframing is carried between the two girders formed by the steel siding and the side sills. The compressive strains in the plates on the side of the car which contains the single entrance door are carried up over the door to a heavy lintel by means of vertical channels at each side of the doorway. This vertical

St. Louis Trail Car—Interior Showing Central Well

reinforcement is furnished only on one side of the sliding-door space, the door being boxed in with light sheathing on the inside.

The floor is sloped up from the center well to the body bolsters, so that while the floor elevation at the well is 24 in., this height is increased to 26¾ in. above the rail at both bolsters. There is also a rise of 1 in. at the entrance vestibule or well, so that the maximum height of the well is 12 in. above the rail, although the step from the street is but 11 in. The minimum height of the main floor above the rail is 24 in.

The weight of the body and trucks complete, including one automatic coupler and one dummy coupler, is 22,500 lb., giving the extremely low weight of 331 lb. per seated passenger. This figure is an estimated one, but has been carefully totaled from the various pieces which have entered into the construction of the car. If the actual weight obtained by track scales is found to check against the above estimated weight, it is believed that this will establish a low record for trail-car weights.

The side posts are made of wood riveted into the steel siding up to the lower lines of the windows. These carry a wooden roof of the plain arched type, the cross-section being the arc of a circle with a radius of 6 ft. 2½ in. No bulkheads are installed in the car body.

The over-all width of 8 ft. 10 7/16 in. is an unusual one, and owing to the fact that the car is to be used strictly for single-end operation it has been possible to overcome the liability of interferences due to the great width by offsetting the car 2 in. over the center line of the trucks. This offset is made toward the door side of the car, so that the distance from the center of the track to the clearance line at the side of the car is 4 ft. 2 7/32 in.

The car is heated by means of a forced-draft, hot-air heater, and is ventilated by eight 6-in. natural-draft ventilators placed in the roof. The signal and light circuits are carried through the couplers between the trailer and its motor car by means of contact blocks of the company's design. These contacts are made automatically when the cars are coupled together.

The general dimensions are as follows:

Length over all	45 ft.
Extreme width	8 ft. 10 7/16 in.
Truck centers	26 ft. 6 in.
Truck wheelbase	4 ft. 6 in.
Diameter of wheels	22 in.
Estimated weight	22,500 lb.
Seating capacity	68
Width of entrance	4 ft.
Height of first step from rail	11 in.

OPERATION

It is intended that the trail cars of this type, when purchased, shall be operated only during the rush hours, which in St. Louis cover one trip in the morning and two trips at night. During the rest of the day they will be kept off the streets. As all of the motor cars operated on the principal lines in St. Louis are equipped with four motors, they have sufficient power to pull a trail car for the short period of time required to handle the rush-hour traffic in the morning and in the afternoon, and it is in consequence believed that in this service a marked increase in the available number of seats, as well as considerable operating economies, will be effected. The car, which is now in service, has met with many expressions of approval from the traveling public in St. Louis, and no difficulty has been experienced on account of the novel entrance features.

COMPILATION OF PUBLIC UTILITY LAWS

The National Civic Federation is now engaged on a compilation and analysis of the laws of the United States and of the several states relating to the public utilities. The work is being undertaken by its department on regulation of interstate and municipal utilities, of which Emerson McMillin, of New York, is chairman. The first of the fifteen parts of this compilation has been issued by the federation from its office at 1 Madison Avenue, New York, and shows a very thorough effort to compile, annotate and cross-index the different laws.

The subjects to be considered in the complete book will be: Rate reasonableness, establishment and change of rates, rate publicity, discrimination, service, accounts, reports of utilities, capitalization, franchises, safety of operation, organization of commission, jurisdiction and definition, general power of commission, commission procedure and enforcement.

The first pamphlet gives an analysis of the laws of the different states upon the subject of accounts, which is divided into the following main heads: Authority of commission respecting accounting practices in general; restriction on number and kind of accounts and records that may be kept by utilities; place of keeping books; depreciation accounts, funds and rates; construction accounts; right of access of commission to books and records of utilities; authority of commission to inspect, examine and investigate books and records of utilities; authority of commission to order production of books and records kept without the state; state audit of accounts; special examination of a railroad company, and special penalties for violation of provisions relating to accounts.

TRIAL TRIP OF NEW YORK DOUBLE-DECK CAR

The double-deck car, No. 6000, of the New York Railways, described in the Electric Railway Journal of last week, had a trial run on Aug. 14. The passengers consisted of the officers of the road and a few invited guests and made the trip from the West Twenty-third Street yards to the Broadway line and then to South Ferry without difficulty. The car then ran on the Broadway and Seventh

Copyright American Press Association.

New York Double-Deck Car at Bowling Green

Avenue line to Fifty-ninth Street. Afterward it was taken from the road, and it is now being fitted up for regular service.

Another trip, in which the participants will be principally railway men, will be made Aug. 20, after which the car will be placed in regular service on the Broadway and Seventh Avenue line between Fifty-ninth Street and South Ferry.

The progress of the car on Broadway attracted great attention, even more than the stepless car which was put in the service about three months ago and was also designed by Frank Hedley and J. S. Doyle of the Interborough Rapid Transit Company. The daily papers have complimented the company upon its effort, as illustrated in this car, to improve its service. The principal reasons which led to the design of the car and its equipment, according to Mr. Hedley, were the following:

To increase the safety of passengers by eliminating the dangers in getting on and off cars.

To increase the safety of pedestrians by having an extremely low fender, so arranged that contact with it automatically shuts off the power, applies brakes in emergency and instantly lowers fender to rails.

To reduce greatly the discomfort and inconvenience of entering and leaving cars.

To increase the comfort of passengers by providing improved and increased seating facilities.

To better working conditions of motormen and conductors.

To provide greater sanitation.

To provide scientific ventilation and heating.

To provide open-air transit during the entire year.

To provide suitable and satisfactory facilities for passengers desiring to smoke.

To increase the carrying capacity of the railroad.

To reduce traffic congestion by practically doubling the carrying capacity per foot of street occupied.

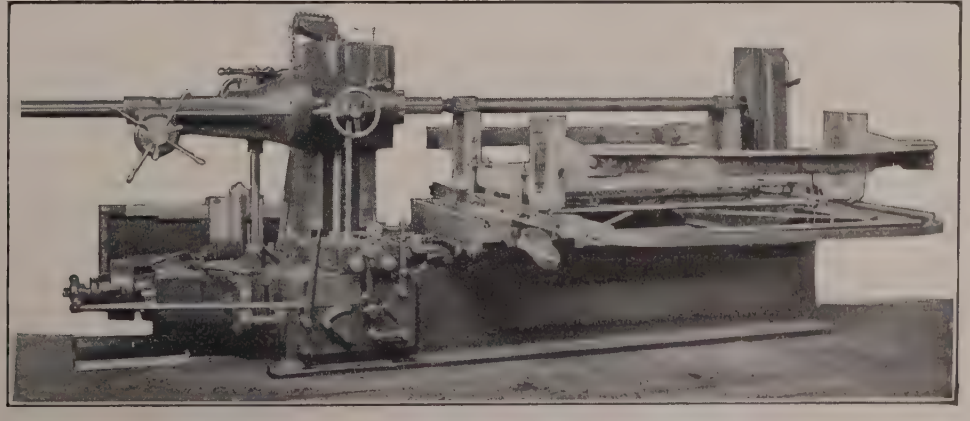
A noticeable feature of the operation of the car during its trial trip was the absence of swaying even when the car passed around curves, and the upper deck seemed as steady as the lower deck. This may be due to the low center of gravity of the car or to the method of mounting the car.

During the trip the conductor announced the different cross-streets to the passengers on the upper deck by the magnaphone which forms a feature of the car. The transmitter, which is similar to an ordinary telephone transmitter, is in front of the conductor on the lower deck and there are announcing horns at each end and at the center of the upper deck.

SPECIAL TRUCK-FRAME MILLING MACHINE USED BY CLEVELAND RAILWAY

The Cleveland Railway Company has recently purchased and put in operation a special horizontal boring, drilling and milling machine, which is shown in the illustration. The mechanical department has experienced much trouble in maintaining a tight fit in the journal-box yoke in the truck side frames. The sides of the yoke wear unevenly, and until the special machine was purchased it was practically impossible to mill them so that a new wearing strip could be applied, and there was always the question of keeping the axles square with the truck frame. Unequal cuttings due to unequal wear would throw the axle askew if an ordinary milling machine had been used.

The new machine was purchased from the Lucas Machine Tool Company, of Cleveland, Ohio, and is special in that the bedplate was made long enough to insert a milling bar which would cut the two yokes of a cast-steel truck frame in one operation, while at the same time the entire truck frame could be held in a fixed position while the four yokes were being milled. This assures a perfectly square truck when the milling is complete. The cuttings are made of sufficient depth to apply a wearing strip. This strip may be renewed when necessary and the life of the truck frame is prolonged indefinitely.



Milling Machine at Lakewood Car Shops, Cleveland

The machine is motor-driven from a motor set under the bedplate at the control end. The new milling machine is served by an overhead traveling hoist of ample capacity to convey the truck frames to and from the truck department. The cost of milling has been greatly reduced in that one man can mill five truck frames in a ten-hour day.

THIRD AVENUE RAILWAY'S SPECIFICATION FOR RUBBER-INSULATED CABLE FOR D. C. SERVICE

The Third Avenue Railway, New York, recently ordered some No. 0000 nineteen-strand copper cable with 6/32-in. rubber insulation and 3/32-in. lead sheath under a specification which defines more definitely than formerly the chemical and physical characteristics required of the vulcanized rubber compound. This high-grade cable is to be used for 600-volt d.c. railway circuits in underground conduits to insure freedom from trouble in wet conduits, that is, it is employed only on short taps to the conductor rail where it is exposed to the weather. In fact, the same cable is specified by the company for its 6600-volt service except that the insulation is 7/32 in. instead of 6/32 in.

It will be noted that the following specification calls for the usual percentage of Para rubber, but it also defines the percentages of resinous matter, acetone extract, free sulphur and ash. Furthermore, the stretching test now calls for a final elongation of 9 in. between marks made 2 in. apart on a 4-in. sample.

SPECIFICATION FOR RUBBER-COVERED CABLE

"The vulcanized rubber compound shall contain not less than 30 per cent by weight of pure fine dry Para rubber which has not previously been used in rubber compounds. The gum itself shall contain not more than 3½ per cent of resinous extract. The remaining 70 per cent of the compound shall consist of mineral matter only. The insulation must be tough elastic, adhering strongly to the wire; it must be homogeneous in character and placed concentrically about the conductor to the minimum thickness of 6/32 in. Samples of the vulcanized rubber insulation not less than 4 in. in length shall have marks placed upon them 2 in. apart. Each sample shall be stretched until the marks are 8 in. apart and then at once released. One minute after such release the marks shall be not more than 2⅜ in. apart. The sample shall then be stretched until the marks are 9 in. apart before breaking. The insulation must have a tensile strength of not less than 800 lb. per square inch. The vulcanized rubber compound shall contain not more than 6 per cent by weight of acetone extract and not more than 0.7 per cent of free sulphur and a minimum of 62 per cent and a maximum of 68 per cent of ash. The cable must withstand an alternating emf of 15,000 volts between conductor and sheath for one minute."

OPERATING RECORDS OF BROOKLYN CENTER-ENTRANCE CAR

Since June 11, 1912, a trip-by-trip record has been maintained by the mechanical department of the Brooklyn Rapid Transit Company of the performance of the center-entrance car which was described in the Electric Railway Journal for June 22, 1912. During June the car was operated for 1722.46 car miles, and during July, when it did not miss a day, for 3753.10 car miles. The increasing familiarity of the crew and public with the car is indicated by the fact that the time per passenger boarding and alighting was decreased from 3.72 seconds in June to 2.29 seconds in July. In turn, the average length of stop was reduced from 7.83 seconds in June to 5.55 seconds in July. Although the average number of stops per mile actually rose from 8.01 in June to 8.24 in July, the average schedule speed increased from 8.23 m.p.h. in June to 8.47 m.p.h. in July. During July, when a greater variety of observations were made, it was found that the maximum number of passengers on the car at any one time was 108, of which number fifty-eight passengers were seated, and that the average number of passengers boarding and alighting per stop was 2.86. In connection with the figures for boarding and alighting, attention should be called to the fact that they are averages based upon complete trips, many of the stops having been made for single passengers; consequently the figures are not as favorable as they would have been had the observations been made only at corners where a large number of passengers are interchanged at one time. It is planned to continue this careful study of the operation of this center-entrance car for several months longer.

MEETINGS OF THE COMMITTEE ON STANDARDS

Meetings of the committee on standards of the American Electric Railway Association were held on Tuesday, Aug. 13, and Wednesday, Aug. 14, in New York at the Engineering Societies Building. Of the committee, there were present H. H. Adams, Ford, Bacon & Davis, chairman; J. H. Hanna, Capital Traction Company; J. M. Larned, Pittsburgh Railways; L. P. Crecilius, Cleveland Railway; Martin Schreiber, Public Service Railway; E. B. Katte, New York Central & Hudson River Railroad; F. R. Phillips, Pittsburgh Railways; G. W. Palmer, Bay State Street Railway, and G. H. Pegram, Interborough Rapid Transit Company. The following representatives of manufacturers attended during parts of the two days' sessions: H. Gulick, of the Gulick-Henderson Company; H. P. Tieman and C. F. W. Rys, Carnegie Steel Company; A. A. Stevenson and O. C. Skinner, Standard Steel Works Company; G. Aertsen and W. P. Barbay, of the Midvale Steel Company; Frank Slocum, of Jones & Laughlin; C. A. Alden, Pennsylvania Steel Company, and L. R. Ashhurst, of William Wharton, Jr., & Company.

REPORT OF COMMITTEE ON EQUIPMENT

During Tuesday morning's open session reports from the committee on equipment on the subjects of specifications for annealed steel axles and similar parts, specifications for cold-rolled steel axles and specifications for rolled or forged solid wrought-steel wheels were presented, the manufacturers affected by the adoption of these specifications being present and taking part in the discussion. The specifications for annealed steel axles met with objection on the part of the manufacturers with regard to the limits allowed for sulphur and phosphorus, it being requested that the specified limit of 0.04 per cent for both contents be raised to 0.05 per cent. Objection was also made by the manufacturers to the clause requiring that axles be slowly cooled in an annealing furnace after the temperature of 900 deg. Fahr. had been reached in the cooling process. On the other minor points objected to by the manufacturers mutually satisfactory settlements were made during the open session. The specifications for cold-rolled steel axles were generally satisfactory to the manufacturers with the exception of the specified limits for sulphur and phosphorus. The specifications for solid steel wheels provoked a very extended discussion on the matter of allowable variation from the estimated weights, the manufacturers maintaining that if the wheel was rolled to the full size allowed by all of the maximum specified tolerances permitted above the standard dimensions the weight would be increased considerably above that allowed by the specified variation. Mr. Phillips, speaking for the committee on equipment, pointed out the practical impossibility of the inclusion of all maximum tolerances above standard dimension in any one wheel, and cited information received in committee to the effect that commercial weight variations had been found by actual test to be considerably less than those proposed in the specification. Objections by the manufacturers were also raised to the provision for drilling holes for test specimens at a specified location and to the requirement for mating wheels in pairs in accordance with the carbon content of each wheel, it being maintained that the selection of two wheels for a pair with a difference of only five points in carbon content would work an unnecessary hardship upon the manufacturer.

In the executive session following the open discussion with the manufacturers the committee on standards decided to refer the reports on specifications for annealed steel axles and for cold-rolled steel axles back to the committee on equipment with the request that further consideration be given to the points brought out in the open discussion and that the reports be presented directly by that committee before the convention. The report on specifications for solid steel wheels provoked a general discussion over the manufacturers' objections, and during this Mr. Phillips brought out the fact that for two years his company had been mating pairs of wheels in accordance with the carbon content, and this had produced an increase of 50 per cent in the life of the wheel. A letter from a manufacturer was read stating that the specifications were not unreasonably severe and that wheels had in fact been furnished under even more rigid specifications. The report was finally approved as recommended practice for the association by seven of the nine members of the committee present. Two additional votes being required to make up the necessary two-thirds of all members of the committee on standards, the question will be submitted by mail to the members of the committee not present at the meeting.

In the report of the committee on equipment, specifications for couplers on interurban cars on roads engaged in the interchange of cars, and also recommendations on the location of end connections on interurban cars on roads engaged in the interchange of cars, were submitted. The recommendation that these matters be adopted as recommended practice was approved.

REPORT OF COMMITTEE ON POWER DISTRIBUTION

The reports on revision of the specifications for high-tension, three-conductor, paper-insulated, lead-covered cable and the specifications for single-conductor, paper-insulated, lead-covered cable for 1200 volts were approved as recommended.

The recommendation on trolley guards was not approved, the committee on standards maintaining that too many varying conditions affected the question to permit proper application of standard or recommended practice.

The report on the revision of the copper-wire table was referred back to the originating committee for presentation before the convention, at which time the originating committee will have had time to complete the working tables referred to but not submitted in the report to the standards committee. The report on a standard stranding table was approved as recommended, as was also the report on revision of specifications for overhead crossings of electric light and power transmission lines. The recommendation for adoption as recommended practice of sections for grooved trolley wire together with amplified drawings showing the sections was approved and the recommendations on electric wire and cable terminology for adoption as standard were approved.

REPORT OF COMMITTEE ON WAY MATTERS

On Wednesday afternoon an open session attended by the representatives of manufacturers was held to consider the reports submitted by the committtee on way matters. A report on the revision of the specification for open-hearth girder and high T-rails was submitted, this specification having been prepared in conjunction with the American Society for Testing Materials. Discussion of the revisions centered upon the matter of final rolling temperature and the advisability of leaving out of the specification any reference to this temperature. A report on specifications for 9-in. and for 7-in. grooved rails and guard rails was then submitted, together with drawings of the proposed standard sections. Representatives of the manufacturers objected to the proposed designs of guard rail on the ground of insufficient material under the groove and in the guard. A change in the width of groove from 1 9/16 in. to 1 11/16 in. was also suggested.

In the executive session following the open session the committee on standards approved the recommendation for adoption as recommended practice of the revised specification for open-hearth girder and high T-rails as submitted. The report on 7-in. and 9-in. grooved and guard rails was referred back to the committee on way matters for further consideration of the designs of the guard rail. The grooved rail for straight track, which was designed especially for use with the grooved rail for curves without necessity for compromise joints, met with general approval, but was referred back to the originating committee on the ground that the two designs properly should be considered together, as changes in one affected the other. Similar action was taken with regard to the report of the committee on way matters on joint plates for these rails.

REPORT OF COMMITTEE ON HEAVY ELECTRIC TRACTION

A report was presented from the committee on heavy electric traction on the subject of a diagram covering a standard for limiting clearance lines for third-rails and permanent way structures and rolling equipment. This has already been adopted by the American Railway Association and by the American Railway Engineering Association. The recommendation for adoption as standard was approved.

CHICAGO AND CLEVELAND FRANCHISE SETTLEMENTS

Delos F. Wilcox, chief of the bureau of franchises, Public Service Commission, First District, New York, read a paper July 12 at a meeting of the National Municipal League at Los Angeles, Cal., on the operation of the Chicago and Cleveland street railway franchises. He said that while there are many types of street railway franchises in the United States only two cities thus far have worked out street railway settlements of national importance. These two cities are Chicago and Cleveland. The Chicago settlement ordinance has been in operation for a little more than five years and the Cleveland ordinance a little more than two years. Chicago, with a population of 2,185,000, has a street railway traffic of about 600,000,000 a year, and Cleveland, with a population of 560,000, has 200,000,000 riders. The relatively larger number in Cleveland is accounted for partly by the fact that the elevated roads in Chicago handle a large part of the local passenger traffic, and partly by the lower fares in Cleveland.

Before the passage of the Chicago ordinance the city tried to introduce municipal operation, but as finally interpreted by the Supreme Court of Illinois its statutory authority to acquire and operate the railways was subject to such financial conditions that the city could not possibly exercise it. Out of this situation a compromise was fashioned and adopted.

The existing properties were appraised at $50,000,000. New capital required for their rehabilitation was added to the original valuation to make a purchase price at which the city could acquire the property at the end of any six months after a certain period. On the expenditures made by the companies for capital account they are allowed in addition 10 per cent for contractor's profit and 5 per cent for brokerage. After they have earned 5 per cent on the capital value, the net profits are divided in the ratio of 55 per cent to the city and 45 per cent to the company.

RESULTS IN CHICAGO

After referring to the other features of the Chicago franchise, Mr. Wilcox summarized the financial returns of the agreement as follows:

"The original purchase price, including the smaller properties since brought under the ordinance, was $55,775,000. On Feb. 1, 1912, after five years, their aggregate purchase price was $127,492,398, an increase of 128 per cent. During the five-year period the companies had received about $22,000,000 as interest on their investment, $6,432,183 as their 45 per cent of net profits and about $9,000,000 as their percentages of profits on rehabilitation, a total of approxi-

mately $37,500,000, or the equivalent of 8.5 per cent per annum on their investment as shown by the purchase price. During this same period taxes paid to the city and other public bodies amounted to about $4,800,000 and the city's share of profits amounted to $7,804,000.

"How has this scheme worked? Chicago has a physically reconstructed, high-grade street railway system. Practically all the small outlying lines have been brought into the scheme and are now being operated by one or the other of the two companies. This means a universal 5-cent fare for adults and free transfers throughout the city, except in the downtown business district.

"This limitation of the transfer privilege was designed to prevent abuses. It operates to the inconvenience of a number of people who have to walk from a block or two to perhaps a third of a mile to reach their downtown destination, or else pay a second fare. The through-route provisions of the ordinance have not yet been worked out satisfactorily, largely as a result of the jealousies and conflicts of interest of the two companies. Only 9 per cent of the cars entering the business district are through-routed, with the result that a passenger desiring to pass through the heart of the city must submit to considerable delay in waiting for a through car or in making a detour by transfer around the business district, or must change companies and pay a second fare. Downtown traffic is badly congested, partly by reason of the fact that 91 per cent of the cars switch back or go around short single-track loops, crossing and recrossing each other's routes with resultant confusion and delay. Service is generally good so far as physical equipment is concerned, but there are serious complaints of overcrowding during the rush hours. No trailers are used.

"Certain serious mistakes in Chicago's policy have been revealed as the result of five years' experience. The possibility of municipalization was intended as a check upon the companies. In fact, these ordinances were represented as giving them one last chance to make good as servants of the people, the sword of municipal ownership being suspended at all times above their bowed necks by a slender thread. In five years' time that slender thread has grown mighty stout, until timid capital all over the country is clamoring for a chance to bend its neck under a sword suspended by that kind of a string. While the city has been accumulating a purchase fund of about $8,000,000, the purchase price of the property has increased nearly $80,000,000, and the companies have been making 8 per cent on that price. At this rate Chicago will not be likely to continue long to regard as of great practical value the simple announcement of its famous contract: 'Just walk up with the money and you can walk off with the street railways.'

"The mistakes of the Chicago ordinances are mainly three:

"1. They permanently capitalize many millions of dollars of franchise values, superseded properties, city pavements and construction profits, which never should be capitalized at all except as a last resort and in that case should be amortized out of earnings as a first charge after the payment of their interest rates on the investment. It is impossible to tell from the figures available just how much of the purchase price of the Chicago street railways represents bona fide present value of tangible property. I believe, however, that at least 20 per cent or 25 per cent of the purchase price represents elements that never should be permanently capitalized. In fact, it is fairly certain that in the process of rehabilitation more dead capital has been added to the account than the entire accumulation of the city's purchase fund.

"2. The second mistake in the Chicago ordinances is their failure to provide for the investment of the city's purchase fund in the securities of the street railway system. While the companies are pouring new millions of capital into new car lines and getting 5 per cent brokerage and 5 per cent a year as a minimum return the improvident city puts its money into the bank and gets 2¼ per cent interest on it.

"3. The third serious mistake of the Chicago plan is the indefinite and inadequate provision for the permanent supervision of service by the Board of Supervising Engineers after the expiration of the reconstruction period. The ordinances are not very clear on this point, but the board is unquestionably very limited in its initiatory jurisdiction over service matters."

Experience in Cleveland

The paper then describes the Cleveland franchise and concludes as follows:

"Cleveland is getting fair service at a 3-cent rate. It may be that the increase in traffic will overcome the deficit thus far accrued. The city street railroad commissioner has ordered 100 new 55-ft. inside-measurement trailer cars to cut down operating expenses and relieve the rush-hour traffic. Gross receipts in April, 1912, were about $4,000 greater than 1911, in spite of the lower rate of fare, which represented a loss of approximately $50,000 revenue. In Cleveland the city has a right to designate and order improvements to the amount of $2,500,000 which are to be made this year or next. Extensions, betterments and improvements generally may be ordered by the city, and the company must make them, if it can, acting in good faith, secure the funds, unless it claims that the proposed expenditures will impair the future ability of the property to earn the stipulated return on investment. In that case the matter goes to arbitration. The city cannot, however, propose any improvements after it has let the franchise come within fifteen years of expiration. Improvements proposed by the company may be made if approved by the city.

"Cleveland has made the same mistakes as Chicago in permanently capitalizing franchise and pavement values and making no provision for reduction of the capital except during the fifteen-year period prior to the expiration of the franchise. The people are being saved a lot of money. The company's motive for economy is destroyed, but thus far expenditures are being held in check pretty well by arbitrary provisions of the ordinance and the supervising alertness of the city commissioner and the City Council. It is reasonably certain that in spite of its low fare and no profits Cleveland will not have any harder time than Chicago in buying out the local street railway system.

"The experience of the two cities points to one conclusion, namely, that if the municipalization is to be either actual or potential, all franchise values and superseded and imaginary property must be wiped out of the permanent capital account. If this is done and the city wishes to municipalize, it can do so by requiring the property to pay for itself out of earnings. The increased safety of the investment alone will pretty nearly supply the amortization fund without any higher fares. This seems to be the only practicable plan of municipalization that does not involve the assumption by the city of enormous additional debts."

PROGRAM OF INTERNATIONAL ELECTRICAL CONGRESS

The executive committee of the International Electrical Congress, which is to be held in San Francisco in September, 1915, in conjunction with the Panama-Pacific International Exposition and under the auspices of the American Institute of Electrical Engineers, has announced a tentative list of sections. They are to consist of the following:

1. Lighting and illumination, including electric lighting of all kinds, electric radiation, etc.

2. Generation, transmission and distribution, including hydroelectric plants, steam stations, transformers, substations, etc.

3. Electric traction and transportation, including propulsion and electric vehicles.

4. Electric power, including the application of electric motors to industrial purposes.

5. Economics, including load factors, power factors and all problems affecting the economy of electric distribution, also regulation by public service commissions, etc.

6. Machinery, transformers and appliances.

7. Telegraphy and telephony, including all communication and signaling by wires.

8. Wireless telegraphy and telephony, including all communication by electromagnetic waves without wires.

9. Electrochemistry and electrometallurgy, including electric furnaces.

10. Electric measurements and instruments.

11. Protective devices and transient and high-voltage phenomena.

12. Miscellaneous.

COMMUNICATION

PAINTING STEEL BRIDGES AND STRUCTURES

Dallas, Tex., Aug. 8, 1912.

To the Editors:

In the editorial on page 151 of your issue for Aug. 3, on the subject of "Painting Steel Bridges and Structures," there occur the following sentences:

"Careful investigations carried on by the United States government experts tend to show that all corrosion is due to electrolytic action. This action receives impetus from impurities in the metal itself and from the presence of moisture on exposed metal surfaces."

In making the statements contained in these sentences do you intend to convey the idea that ordinary rusting or oxidization of iron caused by the presence of ordinary moisture, such as rain, dew or fog, is due to electrolytic action, in contradistinction to what is commonly known as "chemical action"?

The second sentence would give the impression that such "corrosion" of the iron, whether directly electrical or chemical, could occur without the presence of "moisture." Is this true under ordinary conditions, or is it an actually demonstrated fact that iron can be "corroded"—outside of the action of direct corrosive liquids like acids—in a dry atmosphere, or in one so dry that there would not be a deposit of moisture on the iron?

I am asking this information for the reason that if there can be "corrosion" of the iron without attendant moisture then it would introduce an entirely new factor in the preservation of steel and iron. The whole endeavor for the preservation of steel and iron hitherto has been so to cover it with a protecting and non-oxidizable skin that neither air nor moisture could come into contact with the metal itself. If these two sentences are taken to mean what they say, then such protection as has been tried for in the past would not be a perfect protection, no matter how well it was done.

The writer has had a very thorough experience in the protecting of metals during his eight years' operation of the Galveston electrical properties, where all metals—not only iron and steel—are subject to oxidization and chemical action to an extent not known in any other place. He made some very extensive and interesting experiments tending toward the complete preservation of metals from the above action, and his experience was that where he could virtually "insulate" any metal from the contact of moisture he thoroughly preserved that metal from such action. In other words, where the surface of the metal to be protected could be kept absolutely dry there was never any corrosive action.

In this connection it is right to say that he found it impossible, without prohibitive cost, to form such a perfect "insulation" over the surface of the metal as totally to prevent the entrance of moisture under all conditions, and in the inability to do this, except on a very small surface or area, lies the weakness of any protective covering. If the action of corrosion were one that went on vertically to the surface, like the boring of a very small hole, protection of metals would be much easier, but the action of corrosion seems to be more parallel with the surface than vertical to it, and this is especially the case where chemicals such as ordinary salt or acid fumes are the corrosives. One of the greatest difficulties in the protection of any preservative coating is the inability to obtain a surface without small holes in it. These holes may be caused by the breaking of bubbles formed in the application of the coating, by the drying out and breaking away of the pigment used, or by sheer neglect to "cover" the surface properly.

Where any such holes occur in the protective covering there is an opportunity for moisture or other corrosives to obtain an entrance, and the general action of any such corrosive is to spread along the surface of the metal around the entrance hole, thus undermining the protective coating around the hole, lifting it up and away from the surface of the metal around the corroded portion and opening up fresh metal for corrosion. There are a very great number of compounds which are themselves non-porous and which have elastic life enough to last for a great many years; the main difficulty in most of these compounds is to apply them mechanically so that mechanical openings are not left in their surface for the entrance of any corrosives.

These necessary qualities in the protective covering are matters to which the writer believes sufficient attention has not been paid. The covering used must not only have the characteristic of adhesiveness to the metal and of being impervious to moisture, when used as a covering, but it must also have the quality that it can be applied as a continuous coating and without mechanical openings due either to bubbles or to whatever matter is mixed with it as a pigment, provided it is used merely as a menstruum for the application of what is believed to be a protective pigment.

The subject is by no means a simple one, and the writer has merely given above a rough sketch of the difficulties that attend the protection of metals, especially such metals as steel and iron, which are easily oxidized and whose surface oxidization does not form a protective covering of itself, but is actually a self-increasing cause of corrosion to its base.

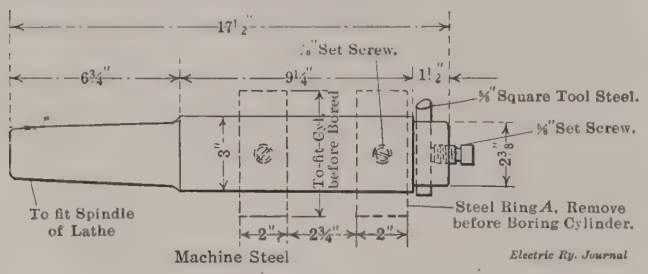
H. S. Cooper.
Secretary Southwestern Electrical & Gas Association.

[The electrolytic theory of the rusting of iron assumes that infinitesimally small currents are set up locally between different portions of the metal having different compositions or segregations of foreign matter. Such action would not compare exactly with electrolysis of underground water pipes, as the latter case involves measurable quantities of current leaving the surface of the metal, yet the basic principle is the same. It should, of course, be remembered that electrolytic action of this kind is really electrochemical action, Volta's original electric battery consisting of a stick of copper and a stick of zinc immersed in a weak solution of sulphuric acid. Corrosion of the zinc followed whenever the two poles were electrically connected, in accordance with a simple chemical reaction which produced sulphate of zinc and free hydrogen.

As our correspondent says, the subject of protecting steel against corrosion is by no means simple and is worthy of the attention which now seems to be accorded to it. The electrolytic theory of rusting is only one of several which have been offered to account for the vagaries of this common and yet complex phenomenon, such as the fact that steam boiler interiors do not rust in service even when the feed water is free from scale-forming material and that steel when incased in concrete, whose porosity is well known, will not rust even when immersed in salt water. In these two instances, at least, the mere presence of moisture is not sufficient.—Eds.]

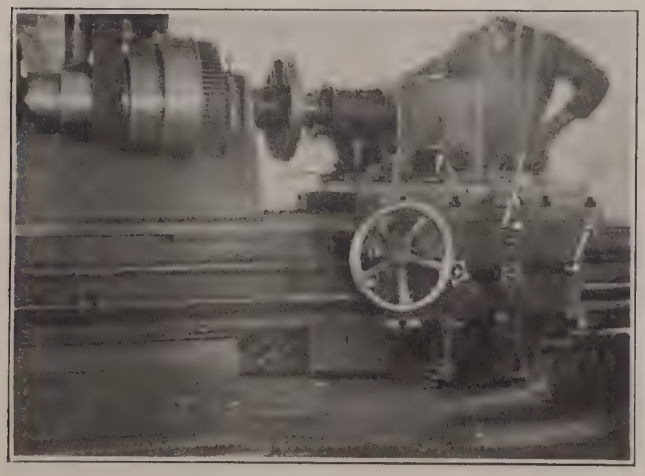
BUSHING AIR COMPRESSOR CYLINDERS AT RICHMOND

The accompanying drawing and halftone show a simple method of boring out air compressor cylinders on the axle lathe, as developed at the Richmond shops of the Virginia Railway & Power Company. The drawing shows the tool holder which fits in the spindle of the lathe with a 5/8-in. square tool held in the end with a set screw. To rebore and bush the air compressor cylinders the following process is carried out:



Tool Holder for Boring Air Compressor Cylinders

Strip the compressor of everything except the cylinders and frame, remove the tool holder and the upper carriage from the lathe, place the tool holder shown in the drawing in the spindle of the lathe with the steel rings marked *A* over the holder. Then place the cylinders on the lathe carriage upside down with the bore of cylinder in line with the lathe spindle and run the carriage forward until the bore of either cylinder fits over the steel rings *A*.



Axle Lathe Used for Bushing Air Compressor Cylinders

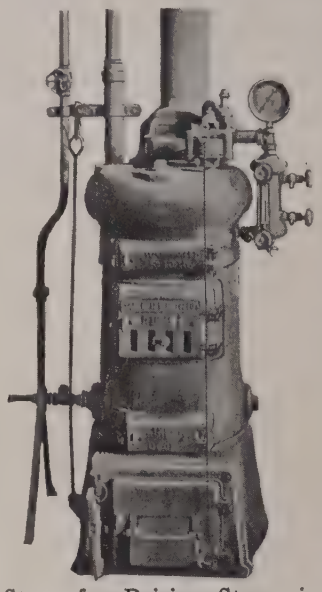
Now shim up between the compressor frame and the carriage of the lathe, then bolt down. The cylinder should now be in perfect line with the lathe spindle. Run the carriage back and remove the steel rings *A* from the tool holder.

All bushings are turned to a standard size and cut 3/8 in. shorter than the air compressor cylinders to allow a shoulder in the back end for the bushing to fit against. The bushings are pulled in the cylinder while chucked in the lathe with a bolt and clamp. Should the piston fit too tightly in the bushing it is skimmed out while the cylinder remains chucked in the lathe. This method of boring and rebushing air compressors gives a perfect job, besides permitting the work to be done in one-third of the time which was formerly required.

The Mysore government is considering the construction of approximately 10 miles of electric lines in the city of Bangalore and cantonment sections, with branches to the outlying suburbs Malleswaram, Basabangudi and Frazertown.

STEAM SUPPLY FOR SHOP SERVICE IN SUMMER

The Sixty-fifth Street shops of the Third Avenue Railway, New York, are heated during the winter months by a steam plant from which an ample supply of steam is then available for the steaming and warping of hood bows, rafters and other car woodwork. However, as this plant is not in operation during the summer months, some special but economical means of generating steam for the purposes described was necessary. At first the way in which woodwork was warped was to bend it over a torch on one side and pour water on the other side—a scheme which proved both unsatisfactory and dangerous. The desired end was finally attained by the installation of the No. 1015 steam boiler stove of the American Radiator Company, which is shown in the accompanying illustration. This stove cost about $36 and has been giving satisfactory service for three years. Its use has made it possible to eliminate the original expensive practice of trying to anticipate the summer demands by bending a large amount of stock during cold weather. A stove of this kind is still more valuable, of course, in shops which are heated by hot air, as in that case it is useful all the year round.



Stove for Raising Steam in Summer.

COMBINATION MOTOR TRUCK FOR NEW HAVEN

The accompanying illustration shows a motor truck operated by trolley and also by storage batteries which has recently been constructed by the Trolley Electric Vehicle Company of America for trial service on the lines of the Connecticut Company at New Haven. The truck is equipped with electric motors and is designed to run part of the time on the tracks of the Connecticut Company, taking power by a trolley from the overhead system, but the

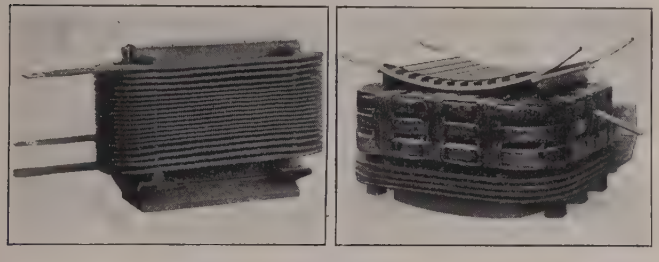
Combined Trolley and Storage Battery Bus

truck is also equipped with storage batteries, and as the wheels do not have the usual flange they can leave the tracks and run over streets in the same way as the ordinary storage battery motor truck. The battery is charged while the car is on the trolley system.

Edgar S. Fassett, formerly general manager United Traction Company, Albany, has been elected vice-president of the Trolley Electric Vehicle Company of America and will give his attention to the development of this car in the future.

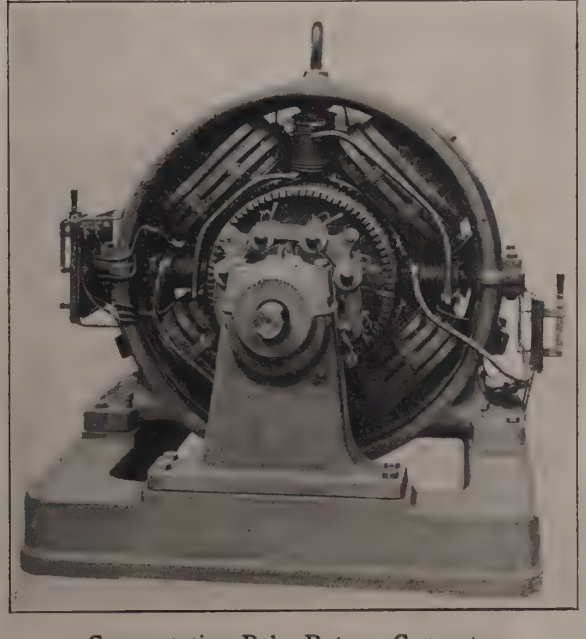
COMMUTATING-POLE ROTARY CONVERTERS

The commutating poles of rotary converters fulfil the same functions and result in the same advantages as in the more familiar application to d.c. generators and motors. As with the commutating-pole d.c. generator, they insure



Commutating Pole and Main Pole with Windings

sparkless commutation with a fixed brush position from no load to heavy overloads. It is unnecessary to shift the brushes with change of load, as the commutating winding is connected directly in series with the armature and holds the neutral position stationary. Hence no brush-shifting device is supplied. The only difference in the application of the commutating poles to rotary converters is purely in design. A rotary converter is inherently a better commutating machine than a d.c. generator as its armature reaction is much less; consequently the commutating-pole coils



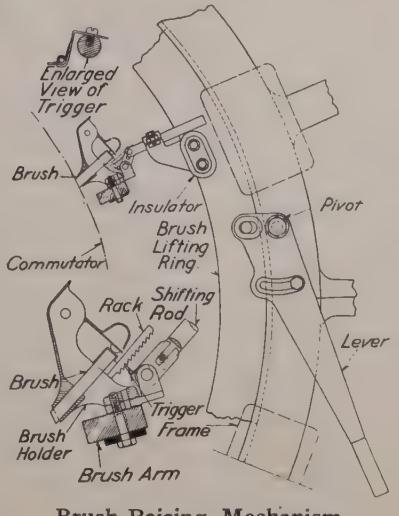
Commutating-Pole Rotary Converter

have a fewer number of turns as less commutating field is required. Commutating-pole rotary converters for railway service can be arranged for automatic compounding from no load to full load in the same manner as the non-commutating-pole machine. The frequent peak loads of railway service can be taken care of without commutation trouble.

The Westinghouse rotary converter commutating pole with its winding removed is shown in one of the accompanying views. The winding is of bar copper bent into the proper form. The inside turns are not insulated but are painted with a heat-proof black paint. The outside turns are insulated with tape which is impregnated with an insulating compound. The coil is supported by insulated bolts, and to prevent accidental grounding an insulating shell is placed between the commutating pole and its winding. The pole is built up of sheet-steel laminations riveted together under pressure.

A main pole with its windings is also shown. The main field pole is made up of sheet-steel laminations riveted together under pressure. The damper winding, which is separate for each pole in the commutating-pole machine, acts as a starting and damping winding, which insures stable operation in the same manner as the solid cage winding on a non-commutating-pole machine. Both main and commutating field windings are constructed to dissipate heat very effectively.

The Westinghouse Company recommends and has standardized the a.c. self-starting method on rotary converters. Owing to inherent qualities in the commutating-pole rotary converter, it is necessary to raise the brushes from the commutator during the starting period when the a.c. self-starting method is used. For this purpose there is used the mechanism illustrated, which has been reproduced for convenience from page 223 of the issue for Aug. 10. To raise the brushes for starting it is necessary only to shift the lever to the other position from the one which is shown in the cut.



Brush-Raising Mechanism

Another view shows a 500-kw, 1500-volt commutating-pole rotary converter for high voltage d.c. railway service. In another installation a 1500-kw, 600-volt motor-started converter has electrically operated remote-control switches mounted on the sides of the converter frame, which are operated by a small control switch located on the switchboard. These switches are used for short-circuiting the commutating winding at starting, thereby making it possible to start up the converter with a starting motor and to throw it on the line without synchronizing.

The Wisconsin Railroad Commission has dismissed the complaint of the city of Janesville against the Rockford Interurban Railway. The complaint alleged that by reason of the fact that the defendant had recently suspended service on certain streets the passengers had been inconvenienced and had been denied the benefit of a reduction in fare recently ordered by the commission; also that the service was deficient on account of inadequate station capacity. The commission held that the company was rendering service in substantial compliance with the terms of its franchise; also that, through an arrangement between the interurban and the city companies, the service along the old route of the interurban was reasonably adequate. No opinion was expressed upon the general adequacy of the service. This will be considered at a subsequent hearing.

News of Electric Railways

Proposal for Underground Line in Montreal

The Comptoir Financier Franco-Canadien has placed before the City Council of Montreal, Que., a letter stating that a party of French capitalists are about to apply to the city for the privilege of constructing an underground electric tramway system in Montreal. The letter was signed by A. E. Forget, secretary-treasurer of the organization. Mr. Forget informed the Council that the Comptoir Financier Franco-Canadien was actively engaged on a project to construct in Montreal a complete system of underground electric tramways, similar to the system in use in Paris. The capital of the company was $100,000,000, which was to be furnished by French bankers. He said that the permanent company was to be formed as soon as the necessary authority, both municipal and legislative, was obtained. A provisional organization had been established, which would later be merged into the permanent concern. The company was obliged to await the opening of Parliament to obtain the requisite powers before full information as to the resources of the company could be laid before the Council. Accompanying the letter was a draft project, which the Aldermen were invited to examine. In this project it was stated that the company desired a fifty-year agreement with powers of renewal. First-class and second-class cars are to be run on the underground trains. First-class tickets are to be 8 cents each, and second-class tickets 4 cents. Workmen's tickets are to be sold at 2 cents each, good during certain hours. The trains are to consist of five coaches, one first-class and four second-class, each coach holding about 110 passengers.

The Chicago Plan Materializing

The first step toward what has been called "the Chicago Plan" was taken last week by the Chicago & Western Indiana Railroad. This company has authorized a bond issue of $200,000,000, the proceeds of which will be used to erect a large passenger terminal and a new freight terminal on the site bounded by Polk, Sixteenth, Clark and State Streets; to purchase the Chicago Union Transfer Railway, known as the Chicago Clearing Yards, for $4,400,000, and transfer the great bulk of interchange cars from the congested downtown terminals to those yards in the southwestern section of the city, and to refund existing bonds of the Chicago & Western Indiana Railroad. It is understood that the Western Indiana Company will lease its Union Transfer Railway to the Belt Railway Company. With this in view the stockholders of the Belt Railway have decided to increase the capital stock and take in eight additional railroads as equal shareholders. The new organization now includes fourteen steam roads, or about all the trunk lines entering Chicago from the south and west.

By entering into this arrangement the Illinois Central Railroad took its first step toward carrying out the contract recently closed with the city of Chicago whereby it releases certain yard areas along the lake front and changes the location of its passenger terminal.

Formal Application for Stock Increase in Cleveland

The Cleveland (Ohio) Railway has applied to the Public Service Commission of Ohio for authority to issue $3,015,000 of common stock, as authorized by the board of directors recently. Of this amount the company states that $1,493,000 will be used toward paying for the $2,500,000 improvements that have been agreed upon by the company and the City Council. The remaining $1,522,000 will be used to retire a similar amount of the $4,583,000 bonds which will mature on March 1, 1913. The expenditures which it is proposed to make for improvements from the proceeds of the present issue follow: Land for substations, $50,000; buildings, $20,000; track extensions, $250,000; track renewals, $700,000; equipment for substations, $500,000; cars, $450,000; automobiles, $10,000, and fire protection, $33,000.

The people of Collinwood, annexed to the city some time ago, have asked that the St. Clair Avenue line be extended to Dille Road and that a crosstown line be built on East 152d Street and Coit Road from the Lake Shore Boulevard to Euclid Avenue.

Conferences have been held recently between the city officials of Cleveland and the officers of the Cleveland Railway to decide several points upon which differences of opinion exist. At one of these conferences attention was called to Article 27 of the Tayler franchise relating to renewal or replacement of wornout equipment. It has been agreed that all subjects of dispute between the company and the city shall be taken up for settlement by negotiation, arbitration or court action.

The subject of deficits has received considerable attention recently. Mayor Baker argued that the company had no right to exceed the expenditures allowed by the Tayler ordinance. He said that the company should have the Council authorize the expenditures or, failing in that, should seek arbitration. Mr. Stanley held that the company had taken no steps without the authority of the street railway commissioner or the Council. The course taken with regard to the maintenance account was adopted because of the need for improvements. The deficits are $150,000 in the operating and $250,000 in the maintenance accounts.

There is now in the treasury of the company as a trust fund in the hands of Horace E. Andrews, former president, $183,000 as proceeds of the municipal stock exchange. Mr. Stanley contends that this should be divided among the stockholders, but Mayor Baker says that it belongs to the company and not to the stockholders. The disposition of two other funds, $190,000 in the accident account and $232,000 which remains from operation under the receivers, may be decided upon at future meetings.

Adjournment in New York Moving Platform Case.—The hearing before the Public Service Commission of New York in regard to the construction of a moving platform in Thirty-fourth Street, New York, to extend across the city, has been adjourned until Oct. 8, 1912.

Progress on the Greenville, Spartanburg & Anderson Railway.—The Greenville, Spartanburg & Anderson Railway, Greenville, S. C., has completed track laying between Greenwood and Anderson and hopes to have this part of the road in operation by Sept. 1, 1912. The stretch between Belton and Greenville is about 98 per cent graded. The work between Greenville and Spartanburg will require about another year to complete.

Accident in the Park Avenue Tunnel.—The electric locomotive and the baggage car of the express train of the New York, New Haven & Hartford Railroad from Boston, Mass., which is due at the Grand Central Station, New York, at 7:05 a. m., left the rails in the cut at Fifty-fifth Street and Park Avenue, New York, on Aug. 12, 1912. No one was hurt, but traffic into the station was delayed about an hour while the line was being cleared.

Public Utility Court Urged in Colorado.—The voters of Colorado are being urged to sign an initiative petition for a referendum vote on a proposed law to amend the constitution of that State for the purpose of creating a public utilities court to consist of three members to be appointed by the Governor, the court to have exclusive jurisdiction over every public service within the State and full power to make and enforce reasonable rates and rules for the performance of such service and reasonable regulations for the health and safety of the patrons and employees.

Proposed Car Line for Schenley Park.—At the conference of Councilmen with the Mayor held recently in regard to the matters to be submitted to the voters at the November election for a bond issue, J. D. Callery, president of the Pittsburgh Railways, and S. L. Tone, vice-president of the company, discussed the street railway projected in order to give access to the interior of Schenley Park. The company is anxious, if it is decided to build a line at all, to have a belt line constructed from the Atwood Street district to a

connection with cars running through Squirrel Hill. Although no action was taken, Mr. Tone was requested to prepare a plan of what the company considers the most feasible proposition. Some of the Councilmen favor an automobile bus line through the park.

New York Central Special Train for the Convention.—The Transportation Committee of the American Electric Railway Association and the American Electric Railway Manufacturers' Association, in charge of the special train to the convention over the New York Central & Hudson River Railroad, has issued a circular showing the timetable of the train and describing its advantages. W. H. Sawyer, of Ford, Bacon & Davis, New York, is chairman of the committee, but reservations should be made with Charles C. Castle, 165 Broadway. The program shows that the entertainment feature on the trip out has not been forgotten.

Hearing on Extension of Omnibus Franchise.—On Sept. 20 the Public Service Commission of the First District of New York will hold further hearings on the application of the Fifth Avenue Coach Company for extensions of its routes. The present petition of the company before the commission is an amended form of the original application, dated May 13, 1912, upon which the commission held several hearings. After the last hearing the company filed an amended petition, dated July 29, 1912, in which it agrees that the duration of the franchise for the proposed extensions shall be limited to a period of twenty-five years. Among the extensions asked for in the petition of May 13 are routes that will serve both the Pennsylvania Terminal and the Grand Central Terminal.

Fire in Jamestown.—The boiler house of the Jamestown (N. Y.) Street Railway containing part of the auxiliary generating plant of the company caught fire at 3:15 a. m. on Aug. 10, 1912, from some unknown cause. The roof, which was constructed of steel and wood, was entirely destroyed by the flames, but the boilers and steam line were not injured. The boiler room is separated from the main generating plant by a fireproof wall. The damage done by the fire to the coal and ash conveyor, mechanical stokers and blowers crippled the company's service somewhat, but a limited number of cars were in service at 7.30 a. m., the day on which the fire occurred, and at noon on that day the service was fully restored. The company estimates that it will cost about $25,000 to restore the plant to its original condition.

Proposed Scenic Railway.—A new plan for the construction of a scenic railway up Grouse Mountain has been submitted to the North Vancouver Municipal Council by A. Phillips. The plan is to build a cable line from the end of the proposed extension of the British Columbia Electric Railway to Essex Street, up the mountain side. The first section of the proposed line would have a grade of 15 per cent and the second section a grade of 28 per cent. Right of way would not have to be purchased. The preliminary estimate of the cost of construction is $50,000. Power could be purchased from the British Columbia Electric Railway. The Council has appointed a committee to interview the promoters of the line, the officers of the British Columbia Electric Railway and the members of the District Council.

Construction of Bridge Line Authorized in New York.—The Public Service Commission of the First District of New York has granted the application of the Manhattan Bridge Three-Cent Line to begin operation under the terms of its franchise and to do such construction work on the Manhattan Bridge and its approaches and on the Flatbush Avenue extension to Fulton Street, Brooklyn, as may be necessary to facilitate the operation of the company's proposed line. The commission has also granted a certificate of necessity and convenience to the Brooklyn & North River Railroad for its proposed line across the bridge. The stock of the Brooklyn & North River Railroad is owned jointly by the Brooklyn Heights Railroad, the Coney Island & Brooklyn Railroad, the Third Avenue Railway and the New York Railways. As noted in the department "Financial and Corporate" the commission has approved the application of the Manhattan Bridge Three-Cent Line to increase its authorized capital stock from $50,000 to $1,000,000 and to issue $200,000 of stock to defray the cost of constructing the company's line.

Financial and Corporate

Stock and Money Markets

Aug. 14, 1912.

The market for securities traded in on the New York Stock Exchange broadened to-day and all of the shares most actively traded in advanced impressively. The sales of the traction stocks were small, but there were significant dealings in Brooklyn Rapid Transit 4's and in New York Railways adjustment 5's. The trading in the electric industrial issues was confined to small lots. Rates in the money market to-day were: Call, 2¾@3 per cent; sixty days, 3½@3¾ per cent; ninety days, 3¾@4 per cent.

In the Philadelphia market trading to-day was quiet. Philadelphia Rapid Transit issues ruled stronger, 52½ being bid for 500 shares of Rapid Transit voting trust certificates. Fairmount Park Transportation continued in demand and advanced to 11.

In the Chicago market price movements were irregular but the market was broader. The bond market was very dull. The sales of the traction issues were not significant.

The Boston market to-day was active in only a few specialties, but was very broad. There were small sales of the Boston Elevated and the West End issues.

In the Baltimore market small sales were recorded of the stock of the Augusta & Aiken Electric and the United Railways. The market for bonds was dull.

Quotations of traction and manufacturing securities as compared with last week follow:

	Aug. 7.	Aug. 14.
American Brake Shoe & Foundry (common)	95¾	a96½
American Brake Shoe & Foundry (preferred)	137½	a142¾
American Cities Company (common)	32	a32⅛
American Cities Company (preferred)	75¾	78½
American Light & Traction Company (common)	a414	a430
American Light & Traction Company (preferred)	a110	a112
American Railways Company	a44	a43¾
Aurora, Elgin & Chicago Railroad (common)	a47½	a47
Aurora, Elgin & Chicago Railroad (preferred)	a89½	a89
Boston Elevated Railway	a122	a125
Boston Suburban Electric Companies (common)	a15	*15
Boston Suburban Electric Companies (preferred)	a80	*80
Boston & Worcester Electric Companies (common)	a10	a10
Boston & Worcester Electric Companies (preferred)	53	a53
Brooklyn Rapid Transit Company	92¾	93¼
Capital Traction Company, Washington	123¾	123¼
Chicago City Railway	a190	a190
Chicago Elevated Railways (common)	a35	a34
Chicago Elevated Railways (preferred)	a92	a92
Chicago Railways, ptcptg., ctf. 1	a92	a92
Chicago Railways, ptcptg., ctf. 2	a25	a24¾
Chicago Railways, ptcptg., ctf. 3	a8½	a8½
Chicago Railways, ptcptg., ctf. 4	a4	a4
Cincinnati Street Railway	*129	a131
Cleveland Railway	a105⅞	a106
Cleveland, Southwestern & Columbus Ry. (common)	5¼	*5¼
Cleveland, Southwestern & Columbus Ry. (preferred)	a35	*35
Columbus Railway & Light Company	a55	a55
Columbus Railway (common)	a80	a80
Columbus Railway (preferred)	a95	a95
Dayton Street Railway (common)	25	25
Dayton Street Railway (preferred)	100	100
Denver & Northwestern Railway	140	140
Detroit United Railway	70	70
General Electric Company	181	183¼
Georgia Railway & Electric Company (common)	a126	a125
Georgia Railway & Electric Company (preferred)	a86	a85
Indiana Union Traction Company	*12	12
Interborough Metropolitan Company (common)	20⅞	20¾
Interborough Metropolitan Company (preferred)	60⅞	60½
International Traction Co., 4% bond rcts	*75	*75
Kansas City Railway & Light Company (common)	18½	15¼
Kansas City Railway & Light Company (preferred)	a45	a41
Lake Shore Electric Railway (common)	a8½	*8½
Lake Shore Electric Railway (1st preferred)	*85	*85
Lake Shore Electric Railway (2d preferred)	*22	*22
Manhattan Railway	134	134
Massachusetts Electric Companies (common)	a19	a19
Massachusetts Electric Companies (preferred)	a77½	a77
Milwaukee Electric Railway & Light (preferred)	*105	*105
Norfolk Railway & Light Company	a26	26
North American Company	83¼	a83½
Northern Ohio Light & Traction Company (common)	a65¼	a70
Northern Ohio Light & Traction Company (preferred)	100½	a105
Philadelphia Company, Pittsburgh (common)	a51¾	a51¾
Philadelphia Company, Pittsburgh (preferred)	a45	a43¾
Philadelphia Rapid Transit Company	a25⅞	a25½
Portland Railway, Light & Power Company	*69	*69
Public Service Corporation	114	120
Third Avenue Railway, New York	37⅜	38
Toledo Railways & Light Company	a6	a8
Twin City Rapid Transit Co., Minneapolis (common)	107¾	a108
United Ry. & Electric Company (Baltimore)	a24¼	24⅞
United Rys. Inv. Company (common)	29	a33¼
United Rys. Inv. Company (preferred)	58	62⅞
Virginia Railway & Power Company (common)	*44½	44½
Virginia Railway & Power Company (preferred)	87½	87½
Washington Ry. & Electric Company (common)	90	90
Washington Ry. & Electric Company (preferred)	94	94
West End Street Railway, Boston (common)	a86	85½
West End Street Railway, Boston (preferred)	a100½	99
Westinghouse Elec. & Mfg. Company	84⅝	*84⅝
Westinghouse Elec. & Mfg. Company (1st preferred)	124	a126

*Last sale. a Asked.

ANNUAL REPORTS

Lake Shore Electric Railway

Earnings and expenses of the Lake Shore Electric Railway during 1911 compared with the previous year as follows:

	1911.	1910.
Earnings.		
Passenger revenue	$872,566	$842,882
Baggage revenue	2,602	2,625
Parlor, chair and special car revenue	5,607	5,725
Mail revenue	1,961	1,963
Milk revenue	2,655	2,489
Freight revenue	86,467	63,837
Switching revenue	....	345
Miscellaneous transportation revenue	276	11
Station and car privileges	2,966	2,403
Parcel room receipts	500	428
Storage	73	72
Rent of tracks and terminals	1,648	1,637
Rent of equipment	8,648	5,152
Rent of buildings and other property	515	758
Power	10,365	11,267
Miscellaneous	12,790	10,450
Total	$1,009,639	$952,044
Expenses and Taxes.		
Maintenance way and structure	$80,561	$73,973
Maintenance equipment	68,472	66,416
Operation power plants	94,055	88,945
Conducting transportation	181,876	164,953
General and taxes	127,566	109,542
Total	$552,530	$503,829
Net earnings	457,109	448,215
Other income	25,000	25,000
Surplus	$482,109	$473,215
Interest paid	319,276	320,360
Net surplus	$162,833	$152,855

E. W. Moore, the president, says in part in the report to stockholders:

"All cars used in limited service were equipped with radial M. C. B. couplers after the rear platforms were raised. These cars were also equipped with electrical couplers for use in train service. Five open cars were purchased for use in Sandusky City. Two new cars were purchased from the Jewett Car Company. These cars are equipped with Standard motor trucks and four 100-hp motors, and were built for use in the Cleveland-Lima service.

"Through service was established between Cleveland and Detroit, a distance of 176 miles, on June 18 on a two-hour limited schedule.

"Through service between Cleveland and Lima, a distance of 160 miles, was established on Aug. 2.

"The business, by reason of this service, has increased in a satisfactory manner and we anticipate an increased growth in this long-distance business, thereby adding materially to our earnings in the future.

"The company's property as a whole has been well maintained during the year."

Traffic statistics in the last two years compare as follows:

	1911.	1910.
Per cent. of operation	55.72	52.92
Car miles	3,276,608	3,260,073
Income per mile—cents	30.81	29.20
Operating and taxes per mile—cents	16.86	15.45
Net earnings per mile—cents	13.95	13.75
Passengers carried	5,323,348	5,159,957
Earnings per passenger—cents	16.62	16.50

Brunswick Terminal & Railway Securities Company

The annual report of the Brunswick (Ga.) Terminal & Railway Securities Company for the year ended Dec. 31, 1911, shows the following profit and loss statement:

Rents		$3,490
Interest and dividends		18,565
		$22,055
Expenses	$2,549	
Salaries	3,500	
Taxes	6,943	
Building repairs	249	
Fire insurance	159	
Discount on bonds sold	525	
		13,925
Surplus to profit and loss account		$8,130

T. D. Rhodes, the president, says in part in his report to the stockholders:

"In submitting its report your board feels that the stockholders may well be congratulated on the advancement of their interests during the period covered by the report. The policy of improvements and betterments inaugurated by the management upon its acquirement of the public utilities of Brunswick has been continued during the year and has found justification in the increased earnings already shown and in the outlook for still better returns on its investments in the near future.

"The general condition of all the company's properties is excellent. The tracks of the City & Suburban Street Railway have been further extended to reach certain industrial plants newly located in that territory employing a very considerable number of laborers, and for the further purpose of developing a section of the city in which this company is a large owner of real estate.

"The gross earnings of the street railway lines were $33,629, a gratifying increase of $4,604 for the twelve months' operation, equal to almost 16 per cent over the previous year.

"The gross earnings of the Mutual Light & Water Company were $78,826, an increase of $5,714, equal to 7.83 per cent over the previous year.

"The water mains of the company have been extended, giving greater fire protection under its contract with the city and affording a number of additional domestic service connections which will result in a considerable increase in the earnings of the company.

"There have been several important extensions in the primary lines of the company's electric department and a number in secondary lines for service connections as well.

"Your board will continue its policy of improvement and betterment of its subsidiaries on the same conservative lines heretofore pursued to such extent as their present business and future prospects warrant.

"While real estate investments in Brunswick have been subject to the same depression and consequent inactivity prevailing everywhere else, it is believed that the turning point has been reached and that the coming year will show a considerable improvement both in the number of transactions and in the prices obtainable."

Birmingham Railway, Light & Power Company, Birmingham, Ala.—The property of the Birmingham & Edgewood Electric Railway has been formally transferred to the Birmingham Railway, Light & Power Company, and new officers have been elected for the former as follows: M. S. Sloan, assistant to the president of the Birmingham Railway, Light & Power Company, president; George H. Harris, vice-president; T. H. Rabe, secretary and treasurer. The purchase of the Birmingham & Edgewood Electric Railway by the Birmingham Railway, Light & Power Company was noted in the Electric Railway Journal of June 29, 1912, page 1140.

Chicago & Milwaukee Electric Railroad, Chicago, Ill.—The Chicago & Milwaukee Electric Railroad, which has been in the hands of a receiver for several years, has been ordered sold by a decree of sale entered in Milwaukee by Judge Geiger of the United States Court. This decree covers the portion of the line in Wisconsin. The order for foreclosure of the mortgage and the sale of that portion of the line in Illinois was issued by Judge Landis several months ago. The decree of Judge Geiger directs Special Master C. B. Morrison, Chicago, to arrange for the sale at a date to be set by the court or agreed to by the interested parties. The operation of the road is at present in charge of W. O. Johnson, one of the receivers.

Cumberland County Power & Light Company, Portland, Maine.—The Cumberland County Power & Light Company has called for payment at 105 and interest at the office of the Windsor Trust Company the entire outstanding issue of $947,000 of first mortgage 5 per cent bonds due on Sept. 1, 1940. These bonds are guaranteed principal and interest by the Portland Electric Company. The Cumberland County Light & Power Company controls the Portland Electric Company, the Lewiston, Augusta & Waterville Street Railway and the Portland Railroad.

Fairmount Park Transportation Company, Philadelphia, Pa.—Franklin Selliman of E. W. Clark & Company, Philadelphia, has been elected a director of the Fairmount Park Transportation Company.

Geneva & Auburn Railway, Seneca Falls, N. Y.—Brief mention was made in the ELECTRIC RAILWAY JOURNAL of Aug. 10, 1912, page 230, of the petition of a committee of the bondholders of the Geneva & Auburn Railway to the Public Service Commission of the Second District of New York for permission to organize a successor company. The present outstanding capitalization of the company is $400,000 first mortgage 5 per cent bonds, $100,000 of 6 per cent cumulative preferred stock and $350,000 of common stock. All of the bonds and shares until June 26, 1912, were held by the West End Trust Company, Philadelphia, as trustee. On this date the securities were sold at public auction in Philadelphia and purchased by the reorganization committee. The company defaulted in payment of interest upon the bonds due in April in October, 1911, and receivers were appointed on Feb. 5, 1912. The company now desires to issue first mortgage 5 per cent gold bonds to the amount of $450,000; $150,000 of non-cumulative stock preferred as to principal and as to dividends to the amount of 5 per cent, and $300,000 of common stock, the securities to be distributed among such of those now interested in the railway properties as will join with the petitioners in the reorganization of the company.

Grand Rapids, Grand Haven & Muskegon Railway, Grand Rapids, Mich.—New officers have been elected as follows by the Grand Rapids, Grand Haven & Muskegon Railway, which was taken over some time ago by the United Light & Railways Company: Richard Schaddelee, president; Frank T. Hulswit, first vice-president; W. K. Morley, second vice-president and general manager; L. H. Heinke, secretary; Benjamin C. Robinson, treasurer.

Hattiesburg (Miss.) Traction Company.—The Hattiesburg Traction Company has filed for record a mortgage to secure an issue of $2,500,000 of bonds. The company has outstanding $280,000 of first mortgage 6 per cent bonds which it is proposed. to refund.

Manhattan Bridge Three-Cent Line, New York, N. Y.—The Public Service Commission of the First District of New York has approved the application of the Manhattan Bridge Three-Cent Line to increase its authorized capital stock from $50,000 to $1,000,000 and to issue $200,000 of stock to defray the cost of constructing and equipping the company's line across the Manhattan Bridge.

Paris (Tex.) Traction Company.—The Texas Power & Light Company, the incorporation of which was noted in the ELECTRIC RAILWAY JOURNAL of June 15, 1912, page 1052, has taken over the Paris Traction Company.

Public Service Railway, Newark, N. J.—The Board of Public Utility Commissioners of New Jersey has approved a mortgage for $1,200,000 dated April 1, 1912, and made by the Elizabeth, New Brunswick & Trenton Railroad to the Logan Trust Company, Philadelphia, Pa. The commission has authorized the company to issue $990,000 of bonds under the mortgage, the proceeds to be used to rehabilitate and extend the line. The commission has also authorized the Riverside Traction Company to issue $500,000 of bonds.

Third Avenue Railway, New York, N. Y.—Judge Lacombe, of the United States District Court, has signed a decree discharging F. W. Whitridge as receiver of the Third Avenue Railroad and the Union Railway. The Third Avenue Railway is the successor to the Third Avenue Railroad.

Underground Electric Railways, London, Eng.—Speyer Brothers have issued in London £1,000,000 of 4½ per cent first debenture stock of the London General Omnibus Company at 98 and £1,000,000 of the same company's 5 per cent cumulative income debenture stock at 94 per cent. The £1,000,000 of 4½ per cent first debenture stock forms part of a total authorized issue of £1,500,000. The £1,000,000 of 5 per cent cumulative income debenture stock is part of a total authorized issue of £1,750,000. The London General Omnibus Company will own about 91 per cent of the motor omnibuses now running in London. The motor omnibuses acquired number more than 1,900, about 80 per cent of which are of the latest type. Except for the qualification shares of the directors the whole of the issued capital of the London General Omnibus Company will be owned by the Underground Electric Railways.

West Virginia Traction & Electric Company, Wheeling, W. Va.—William Morris Imbrie & Company, New York, N. Y., are offering for subscription at 96½ and interest to yield about 6.30 per cent $1,250,000 of secured convertible 5 per cent three-year gold notes of the West Virginia Traction & Electric Company. The notes are in the denomination of $1,000 each and are callable at 102 and interest. The Equitable Trust Company, New York, N. Y., is trustee of the issue. The organization of the West Virginia Traction & Electric Company was referred to in the ELECTRIC RAILWAY JOURNAL of July 27, 1912, page 141.

Wichita Falls (Tex.) Traction Company.—J. A. Kemp, president of the Wichita Falls Traction Company and the Wichita Falls Water & Light Company, and Frank Kell, vice-president of the Wichita Falls Water & Light Company, are reported to have disposed of their holdings in the companies to J. F. Strickland, of the J. F. Strickland Company, who is president of the Texas Traction Company.

Dividends Declared

Federal Light & Traction Company, New York, N. Y., quarterly, 1½ per cent, preferred.

Kokomo, Marion & Western Traction Company, Kokomo, Ind., 3 per cent, common.

Pacific Gas & Electric Company, San Francisco, Cal., quarterly, 1½ per cent, preferred.

Rochester Railway & Light Company, Rochester, N. Y., quarterly, 1¼ per cent, preferred.

ELECTRIC RAILWAY MONTHLY EARNINGS

BANGOR RAILWAY & ELECTRIC COMPANY.

Period	Gross Earnings.	Operating Expenses.	Net Earnings.	Fixed Charges.	Net Income.
1m., June, '12	$61,590	*$28,333	$33,257	$16,558	$16,699
1 " " '11	49,580	*25,337	24,243	12,472	11,771
12 " " '12	635,622	*295,171	360,451	181,466	178,985
12 " " '11	574,980	*270,300	304,680	146,517	158,163

CHATTANOOGA RAILWAY & LIGHT COMPANY.

1m., June, '12	$89,470	*$54,892	$34,578	$22,146	$12,432
1 " " '11	77,910	*45,294	32,616	20,430	12,186
6 " " '12	498,558	*295,514	203,044	129,380	73,664
6 " " '11	445,955	*257,023	188,932	117,596	71,336

COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY, GRAND RAPIDS, MICH.

1m., June, '12	$483,418	*$295,288	$188,130	$127,657	$60,473
1 " " '11	432,614	*254,601	178,013	108,132	69,881
6 " " '12	2,976,329	*1,735,626	1,240,703	715,760	524,943
6 " " '11	2,629,084	*1,504,188	1,124,896	619,560	505,336

DETROIT UNITED RAILWAY.

1m., June, '12	$1,045,442	$668,195	$358,703	$176,174	$201,073
1 " " '11	909,728	563,513	329,737	177,179	169,037
6 " " '12	5,490,941	3,494,998	1,895,570	1,066,026	929,917
6 " " '11	4,853,500	3,026,290	1,741,759	1,057,278	769,933

EAST ST. LOUIS & SUBURBAN COMPANY.

1m., June, '12	$194,426	*$111,369	$83,057	$48,279	$34,778
1 " " '11	185,736	*106,973	78,763	45,605	33,158
6 " " '12	1,148,856	*654,290	494,566	288,822	205,744
6 " " '11	1,091,720	*626,836	464,884	272,151	192,733

GRAND RAPIDS RAILWAY.

1m., June, '12	$107,237	*$59,256	$47,981	$14,557	$33,424
1 " " '11	101,647	*58,273	43,374	14,993	28,381
6 " " '12	591,877	*332,323	259,554	87,686	171,868
6 " " '11	553,360	*320,465	232,895	90,338	142,557

LEWISTON, AUGUSTA & WATERVILLE STREET RAILWAY.

1m., June, '12	$59,237	*$32,085	$27,152	$14,446	$12,706
1 " " '11	51,896	*27,878	24,018	13,337	10,681
12 " " '12	609,367	*382,660	226,707	173,379	53,328
12 " " '11	533,019	*331,134	201,885	158,349	43,536

PORTLAND RAILWAY, LIGHT & POWER COMPANY.

1m., June, '12	$582,964	*$277,682	$305,282	$149,040	$156,242
1 " " '11	554,767	*262,172	292,595	129,155	163,440
6 " " '12	3,352,617	*1,647,337	1,605,280	871,176	734,104
6 " " '11	3,114,812	*1,504,136	1,610,676	742,824	867,852

ST. JOSEPH RAILWAY, LIGHT, HEAT & POWER COMPANY.

1m., June, '12	$93,923	*$56,401	$37,522	$19,710	$17,812
1 " " '11	95,021	*57,106	37,915	18,453	19,462
6 " " '12	567,156	*327,293	239,863	118,007	121,856
6 " " '11	530,322	*322,001	208,321	115,474	92,847

UNION RAILWAY, GAS & ELECTRIC COMPANY, ROCKFORD, ILL.

1m., June, '12	$272,714	*$162,152	$110,562	$69,302	$41,260
1 " " '11	237,408	*141,328	96,080	61,242	34,838
6 " " '12	1,751,319	*1,052,746	698,926	408,926	289,647
6 " " '11	1,518,456	*897,966	363,149	363,149	257,341

*Includes taxes.

Traffic and Transportation

Rehearings Denied in Fare Cases

The Public Service Commission of the Second District of New York has denied the applications of the Syracuse, Lake Shore & Northern Railroad for rehearings on three orders recently made by the commission reducing rates of fare on the company's line. On July 11 the commission ordered a reduction in fare to be charged from the railroad terminal in Syracuse to Stop 4 from 15 cents to 10 cents for a round trip between these points with the option of a one-way rate of not exceeding 5 cents in each direction. The one-way fare between the points is 10 cents. This order was made following the complaint made by men who reside in Syracuse and are employed at the works of the Halcomb Steel Company.

On July 23 the commission made an order requiring the company to cease limiting its summer season round-trip ticket sold at 20 cents for one day for use in traveling over its line between Syracuse, the common center, and Stop 11, known as Long Branch. The order required that between May 1 and Sept. 30 the ticket should be good for a period of not less than thirty days from the date of sale. In the same order the commission required the company to desist from charging 15 cents for a single trip between Stop 1 on its line in Syracuse and Stop 11 on its line known as Long Branch and to fix the maximum fare for a single trip at 10 cents.

On July 23 the commission also made an order requiring the company to desist from charging its present cash fare of 10 cents for one-way transportation between any point in Fulton north of Fourth Street and Stop 28 on its line outside of the city of Fulton and fixed the maximum fare between these points at 5 cents.

The commission states that it sees no reason to reopen these cases on the grounds set forth by the company, namely, that the reductions seriously and materially decrease the receipts of the company, and that the cost of the construction and equipment of the railroad justify the fares which are now being charged. The commission calls attention to the fact that it was not alleged in the petition for a rehearing whether the matters suggested were or were not presented by the company for the consideration of the commission in deciding the case. If the commission was permitted to pass upon the matters in controversy without its attention being called to such matters, it was the fault of the company. The commission observes that it is not unfamiliar with the amount of capital expended in the construction of the company's road, and points out that a reduction in fare is frequently accompanied by an increase of gross revenue. The company also raised the question whether or not it is entitled to charge 5 cents within the limits of Syracuse in addition to the fare charged outside of the city limits, and asked to be heard on that question. The commission held that in the travel in and out of the city the location of the city line is wholly immaterial. The final disposition of the case is that no rehearing should be granted in any one of the petitions. The reduced rates of fare should be kept in operation long enough to determine whether or not they produce the injurious effects feared by the company. The company should be at liberty after a reasonable time to move again for a rehearing upon this ground provided the facts developed by operation show that such a course is warranted. The company is at liberty to make a motion to modify the order in the Long Branch case with reference to the round-trip excursion tickets so that tickets shall not be good for use after Sept. 30, if it desires.

Denver Transfer Questions

The bill demanding that the Denver (Col.) City Tramway issue universal transfers presented to the Board of Supervisors has been declared illegal in some of its sections by City Attorney Bryant. Supervisor Walker will be asked to modify and change some of the features and again present the bill. The city attorney holds that the courts have ruled on every section of the bill. He says that the company must give a transfer on a transfer but not on lines which do not intersect. It is held that the thirty-minute life of the transfer is not sustained by the courts, which have declared that fifteen minutes is all the time allowed to present a transfer after it is issued. The city attorney also says that the courts have ruled that a passenger must ask for a transfer when the fare is paid.

The ordinance to regulate the issuance of transfers in Denver, as originally drawn, follows:

"Whereas the franchise heretofore granted by the city and county of Denver to the Denver City Tramway provides as follows:

"'The Denver City Tramway, grantee, shall at the place where any of its lines intersect transfer its passengers from one to the other of the intersecting lines for a continuous passage without any charge in addition to the regular fare herein provided for, provided, however, that the said company, its successors and assigns shall not be required to transfer passengers from one of its lines to another which reaches a section of the city near or adjacent to that reached by the first line, and provided further that said company, its successors and assigns may make and enforce proper and reasonable rules, regulations and conditions for the transfer of passengers to and from its different lines.'

"Whereas the said tramway company has placed such an unreasonable construction upon said provision and under such construction has issued and is issuing transfers so restricted in conditions to passengers riding upon its lines, which has given rise to frequent controversy between passengers and car crews and employees of said company and led to the frequent disturbance of the peace, subjecting the city to great cost in quelling such disturbance and maintaining good order and punishing offenders, be it ordained by the City Council of the city and county of Denver:

"Section 1. That all street car companies, tramway companies and traction companies operating under franchises from the city and county of Denver, in the city and county of Denver, which under such franchises are required to issue to passengers transfers upon their several lines shall issue such transfers upon request of such passengers at the time of the payment of the fare, or at any time thereafter, within two blocks from the point of intersection with the line to which such transfer is demanded.

"Section 2. All such transfers shall entitle the transferee to thirty minutes from the time the car upon which such transfer is issued reaches the point of intersection with the line to which such transfer is issued to embark upon the car covered by such transfer. Such transferee shall have the right to embark upon such car at any point beyond one block above the point of intersection.

"Section 3. Transfers shall be issued by said companies as aforesaid, as provided for in Sections 1 and 2 hereof, for continuous passage upon intersecting lines and lines running within one block of each other, operated by the issuing company, including lines running parallel with the line from which such transfer is issued, provided such parallel lines do not at any point approach each other nearer than three blocks."

The transfer requirements of the Denver City Tramway were explained by C. B. Wells, superintendent of transportation of the company, in the Electric Railway Journal of July 6, 1912, page 28.

Fare Decision Affecting Long Island Road

The Public Service Commission of the Second District of New York has directed the New York & Long Island Traction Company to cease at once from charging its present fare of 10 cents for one-way travel over its line between Stop 72 (or Pleasant Street) in Roosevelt and the highway crossing of the Long Island Railroad near the plant of Doubleday, Page & Company, in Garden City, a distance of less than 5 miles, and all in Nassau County, and to establish in place thereof a fare of 5 cents.

The subject of service is under further consideration by the commission. The complainant alleged that under the company's franchise obtained from the highway commissioners of Hempstead on June 6, 1901, the company is restricted to a fare of 5 cents for any 5 miles or less over its

line from the northerly limit of Hempstead to Freeport and therefore as between the particular points mentioned. Commissioner Martin S. Decker prepared the opinion in the matter after several hearings and an extended investigation into the application of various conditions appearing in numerous franchises under which the traction company is operating.

The proceeding involved the intent of the highway commissioners in granting a franchise over a portion of the company's route. The company claimed that under the ratification of the franchise of the supervisors it was relieved from a fare condition expressed in the original franchise of the highway commissioners. The opinion states:

"The highway commissioners of the towns in this State as a rule are not lawyers nor are they skilled in the law, and while in the main keen to protect the public interest in the issuance of grants of authority to railway and other utilities of a public nature, it is not to be expected that they shall know and be able to guard fully against all the possible consequences of granting supplementary consents for special purposes wholly dissociated in their presentation by the company from the original grant or the conditions in such grant expressed. Upon this and other considerations the courts have refused to nullify franchise covenants where doubt is raised by ambiguity of language or where it is contended that subsequent separate grants, or acts having only incidental relation to the original, operate by implication to relieve the grantee from the performance of its obligations. The franchise of June 6, 1901, granted by the board of highway commissioners, has not been amended or modified in terms or by the necessary implication, and we hold that it is in force as to this fare restriction of 5 cents for any 5 miles or less over respondent's line as involved in this case."

The commission in an opinion prepared by Commissioner Decker has declared that the words "and shall not exteed 5 cents for any 5 miles or less" appearing at the end of paragraph 7 of conditions in a franchise granted on Feb. 3, 1903, by the highway commissioners of Hempstead, Nassau County, to the New York & Long Island Traction Company is a condition which appears in conjunction with and refers to the proportion of share which the company may accept as a joint rate and does not refer to the company's local fares, some of which are restricted under the conditions of the paragraph in the franchise, and in line therewith has dismissed the complaints of Edwin G. Wright and Clarence A. Ankers against the company. The company charges a one-way fare of 10 cents between Rockville Center and Valley Stream, a distance of less than 5 miles. The complainants claimed that under the conditions of the company's franchise it is not entitled to charge more than 5 cents for transportation over its line covering a distance of 5 miles or less, and as applied between Rockville Center and the city line on the one hand and Rockville Center and Valley Stream on the other. The commission holds that the question of the reasonableness of the fare charged is not before it and that the sole matter for determination is whether under the franchise the company is prohibited from charging more than 5 cents for a single ride on its line for a distance of 5 miles or less.

Increase in Wages by Middlesex & Boston Street Railway.—The Middlesex & Boston Street Railway has granted an increase in pay of 1 cent an hour to its motormen and conductors. The men are graded and the maximum wage per hour in the future will be 27 cents.

Sprinkling Contract in East St. Louis.—The City Council of East St. Louis has passed an ordinance authorizing the payment of $100 a month to the East St. Louis & Suburban Railway for which the company agrees to sprinkle State Street, along its car tracks, from Thirty-eighth Street to Eighty-ninth Street.

Kenosha Complaint Answered.—The Kenosha Electric Railway and the Milwaukee Electric Light, Heat & Traction Company have filed a joint answer to the complaint made against the companies by the city of Kenosha, Wis., with the Railroad Commission. In the complaint it was charged that the companies had violated the agreements which they have with the city.

Final Report from Engineers in Milwaukee Case.—Halford Erickson, of the Railroad Commission of Wisconsin, is quoted as stating that the final report of the engineers of the commission in regard to the service of the Milwaukee Electric Railway & Light Company has been received and that it will be considered at once and the case involving the question of service and reduced fare decided in the near future.

Talks to Motormen and Conductors in Brooklyn.—The first of a series of talks to motormen and conductors in the employ of the Brooklyn (N. Y.) Rapid Transit Company was delivered recently by Frank O'Keefe, division superintendent, to the employees of the lines of the company which are operated from carhouses at Ridgewood. The men were permitted to make suggestions for the benefit of both company and patrons.

Petition for Extension of Service in Louisville.—The Louisville (Ky.) Railway has been petitioned by residents of the new Audubon Park subdivision of the city to increase the service and establish a 5-cent fare to that district. At present the territory is served by hourly cars upon which a 10-cent fare is charged to all points outside the city limits along the Preston Street interurban line to Okalona. The company has taken the matter under advisement.

Suit to Prevent Elimination of Stops in Cleveland.—Attorney G. D. Hile, as a taxpayer, has brought proceedings to restrain Street Railway Commissioner Witt of Cleveland, Ohio, and the City Council from eliminating half the car stops on Central Avenue and Broadway. Mr. Hile has also asked that Mr. Witt be ordered to restore all stops eliminated on Cedar and Superior Avenues. Mr. Witt claims that the City Council is authorized under the Tayler ordinance to prescribe operating regulations.

Third Arbitrator Chosen in Springfield and Worcester.—Dr. John W. Coughlin, of Fall River, Mass., has accepted the position as the third member of the arbitration board which is to settle the wage question now at issue between the street railways in Worcester and Springfield and their employees. The announcement of Dr. Coughlin's acceptance was made by Mayor Edward Lathrop, who with Mayor O'Connell, of Worcester, was chosen to select the third arbitrator after W. P. Hayes and F. H. Dewey, Worcester, the other two members of the board, failed to agree upon the third member of the board.

Cubs Swell Traffic.—During the recent series of baseball games at the Polo Ground between the New York and Chicago National League Clubs the Interborough Rapid Transit put into temporary service on its Ninth Avenue elevated line an extra express train which was scheduled just before the regular express train of the company which reaches the park immediately before the game. No express service is operated on the elevated after the game, but the subway is near the baseball grounds and on this division there is express service in both directions every day. The run from Rector Street, in the financial district, to the Polo Ground over the Ninth Avenue line is made in twenty-nine minutes.

Front Platform Order in Philadelphia.—The Philadelphia (Pa.) Rapid Transit Company issued the following order on Aug. 9, 1912, in regard to passengers riding on the front platforms of cars: "In accordance with the recommendation and direction of the Pennsylvania State Railroad Commission, no passengers will hereafter be permitted to ride on the front platform of closed cars. Upon open cars the carriage of passengers on front platform will be strictly limited to the number that can be conveniently accommodated upon and do occupy the seats provided on such platform. The commission further directed that passengers occupying seats upon the front platform of open cars shall be prohibited from engaging the attention of the motorman by conversation or otherwise."

Question of Free Transportation of Policemen and Firemen.—Assistant City Attorney Kyle of St. Paul, Minn., has expressed the following opinion in regard to the proposed ordinance to provide for the free transportation of policemen and firemen on the city railways in St. Paul: "The state law provides that no transportation shall be given any individual by a transportation company unless that

individual is in the employ of the company. Police and firemen are not in any sense in the employ of the company and the proposed ordinance therefore is illegal, in my opinion. Mr. O'Neill, I believe, told the members of the Council something about this phase of the situation when the Assembly had the matter up for consideration, but it seems no notice was taken. There is every indication that the company could obtain an injunction to prevent the city from putting the ordinance into effect."

Improved Traffic Conditions in Albany.—James F. Hamilton, acting general manager of the United Traction Company, Albany, N. Y., has addressed the Public Service Commission of the Second District a letter in regard to changes which it is proposed to make to the service of the company. Mr. Hamilton states that a quantity of blue enamel signs with white letters reading "Cars Stop Here" will be installed at points on the Albany and Troy divisions. One of the company's "500" type cars is being equipped with an illuminated dash sign and orders have been issued to change the headlight from the deck of the car to the front dash with the idea of making this a standard with the approval of the commission. A new track will be laid on Washington Avenue to Swan Street and from Swan Street to Lark Street. Arrangements have been made to add six open cars to the Pine Hills line. A number of other improvements are also under consideration. The company has in mind to install a device for opening and closing the exit doors of its cars of the "500" type. Mr. Hamilton conferred recently with Chairman Frank W. Stevens of the commission and with John S. Kennedy, secretary of that body.

Fare Complaint Dismissed.—The Public Service Commission of the Second District of New York has dismissed the complaint of patrons of the Western New York & Pennsylvania Traction Company as to increase in passenger fares between Bolivar and Olean and Weston's Mills and other points on the line. The commission is satisfied that the rates formerly charged by the company were inadequate to take care of operating expenses, taxes and depreciation and afford a reasonable return upon capital invested. The commission has also investigated as to whether one division of the company's road is made to bear an undue proportion of the expense of conducting the entire operations of the road, and finds no evidence to sustain such a claim. The commission has also closed upon its records the complaint of the residents of Bolivar against the Western New York & Pennsylvania Traction Company as to need of repairs and improvements upon the company's lines. After a hearing had upon this complaint the company assured the commission that it would repair and improve its road and put it in good condition for travel.

Official Interurban Map Used for Advertising Purposes.—The following electric railways have ordered and are using for advertising purposes the official interurban railway map prepared by the Central Electric Traffic Association and reproduced as a supplement to the Electric Railway Journal of July 13, 1912: Benton Harbor-St. Joe Railway & Lighting Company; Bluffton, Geneva & Celina Traction Company; Chicago, South Bend & Northern Indiana Railway; Cleveland, Painesville & Eastern Railroad; Columbus, Delaware & Marion Railway; Dayton, Covington & Piqua Traction Company; Dayton & Troy Electric Railway; Detroit United Railway; Evansville Railways; Ft. Wayne & Springfield Railway; Ft. Wayne & Northern Indiana Traction Company; Goshen, South Bend & Chicago Railway; Grand Rapids, Holland & Chicago Railway; Indianapolis & Cincinnati Traction Company; Indianapolis & Louisville Traction Railway; Indianapolis, Newcastle & Eastern Traction Company; Kokomo, Marion & Western Traction Company; Lake Shore Electric Railway; Marion, Bluffton & Eastern Traction Company; Michigan United Traction Company; Muncie & Portland Traction Company; Ohio Electric Railway; Parkersburg, Marietta & Interurban Railway; Springfield, Troy & Piqua Railway; Terre Haute, Indianapolis & Eastern Traction Company; Toledo & Chicago Interurban Railway; Toledo, Bowling Green & Southern Traction Company; Tri-State Railway & Electric Company; Union Traction Company of Indiana; Valparaiso & Northern Railway; Western Ohio Railroad; Winona Interurban Railway.

Personal Mention

Mr. H. J. Parks, electrical engineer of the East St. Louis & Suburban Railway, East St. Louis, Ill., has been appointed acting master mechanic of the company to succeed temporarily Mr. M. M. Lloyd, resigned.

Mr. R. W. Emerson, formerly electrical engineer of the New York & North Shore Traction Company, Roslyn, N. Y., has been appointed general superintendent of the company to succeed Mr. Thomas B. Davis.

Mr. F. D. Powers, freight traffic expert for the Board of Trade of Vancouver, B. C., has been appointed freight traffic agent of the British Columbia Electric Railway, with headquarters at New Westminster, B. C.

Mr. J. R. Empey has resigned as master mechanic of the Cortland County Traction Company, Cortland, N. Y., to become superintendent of the Elmira, Corning & Waverly Traction Company, with offices at Elmira, N. Y.

Mr. M. M. Lloyd has resigned as master mechanic of the East St. Louis & Suburban Railway, East St. Louis, Ill., to accept a position with the Des Moines (Ia.) City Railway under his former employer, Mr. C. F. Hewitt, general manager.

Mr. J. B. Ingersoll has resigned as electrical engineer of the British Columbia Electric Railway, Vancouver, B. C., to become manager of the Kootenai Power & Construction Company, which is building a 40,000-hp hydroelectric plant at Kootenai Falls, Mont., and a transmission line 170 miles long.

Mr. M. J. Kennedy has resigned as general freight agent of the Montreal (Que.) Street Railway to become connected with the Montreal Tunnel Company under Mr. Duncan McDonald, president of the company. Mr. McDonald was formerly general manager of the Montreal Street Railway.

Mr. Edgar S. Fassett, whose resignation as general manager of the United Traction Company, Albany, N. Y., was mentioned in the Electric Railway Journal for July 20, 1912, has been elected vice-president of the Trolley Electric Vehicle Company of America, manufacturer of an auto-truck described elsewhere in this issue.

Mr. S. M. L. McSpadden has been appointed general superintendent and traffic manager of the Grand Junction & Grand River Valley Railway, Grand Junction, Col., and general superintendent of the Grand Junction Electric, Gas & Power Company, to succeed Mr. Charles W. Ford, whose resignation is noted elsewhere in this column. Mr. McSpadden was formerly assistant to Mr. Ford and purchasing agent of the company.

Mr. Lee Massengale is general manager of the Grand View Railroad, which has placed in operation the first section of its road between St. Louis and Continental, Mo. Mr. Massengale was formerly general manager of the Lake View Traction Company, Memphis, Tenn. He was born in Denton, Tex., in 1865, and has been connected with steam and electric railways since 1883. He was at one time master mechanic of the United Railways, St. Louis, Mo., and was also for a time vice-president and general manager of the Iola (Kan.) Electric Railroad.

Mr. Charles W. Ford, who for the last fourteen months has been general superintendent and traffic manager of the Grand Junction & Grand River Valley Railway, Grand Junction, Col., and general superintendent of the Grand Junction Electric, Gas & Power Company, has resigned to accept a similar position in the South. Mr. Ford has been very active in civic matters since his residence in Grand Junction. He is a director of the Chamber of Commerce and only recently resigned as president of the Fifty Thousand Club, of which he was the founder and moving spirit.

Mr. C. E. Holmes has succeeded Mr. Fred Burger as general freight and passenger agent of the Albany Southern Railroad, Hudson, N. Y. Mr. Holmes was formerly assistant general freight and passenger agent of the Otsego & Herkimer Railroad, Hartwick, N. Y. Before becoming connected with the Otsego & Herkimer Railroad he was connected with the Delaware, Lackawanna & Western Railroad

as assistant agent of the company at Cincinnatus, N. Y. He resigned from the Delaware, Lackawanna & Western Railroad in November, 1906, to accept a position as agent with the Otsego & Herkimer Railroad, and the following June was promoted to the position of assistant general freight and passenger agent, in which capacity he continued for five years.

Mr. J. D. Burpee has been appointed superintendent and purchasing agent of the Ottawa (Ont.) Electric Railway to succeed Mr. J. T. Hutcheson, who, as previously noted in the Electric Railway Journal, has been appointed general manager of the Montreal (Que.) Street Railway. Mr. Burpee was born in Ottawa on April 25, 1876, and commenced railway work in 1891 with the Canadian Pacific Railway at Ottawa. He entered the service of the Ottawa Electric Railway in 1893 as a stenographer. From 1896 to 1898 he held the position of cashier and paymaster of the company, and from 1908 to 1912 served the company as accountant, and acted as assistant to the superintendent and to the secretary.

Mr. H. S. Newton has resigned as secretary and general manager of the Hartford & Springfield Street Railway, Warehouse Point, Conn., to become general manager of the Mesaba Railway, which is under construction in the Mesaba Range in northern Minnesota. Mr. Newton was graduated from Ohio State University as an electrical engineer. His first commercial work was with the General Electric Company in its Lynn shops. Later he was transferred to the Thomson-Houston Company at Cincinnati and supervised the installation of apparatus on properties throughout the Central West, including 10 miles of electric railway between Cincinnati and the Soldiers' Home at Marion, Ind. Mr. Newton next became electrical engineer for the Wheeling (W. Va.) Railway. He left Wheeling to accept the position of electrical engineer for the Syracuse (N. Y.) Street Railway. He afterward assumed the same duties for the Syracuse Consolidated Street Railway, and finally was employed in the same capacity with the consolidated company, the Syracuse Rapid Transit Railway. He remained at Syracuse six years and combined for a part of the time the duties of superintendent of transportation with his engineering duties. Mr. Newton was appointed general manager and chief engineer of the Syracuse, Lakeside & Baldwinsville Railroad when the road was projected, and remained with the company in the capacities named during its construction and for the first two years of its operation. Mr. Newton next became general manager of the Beaver Valley Traction Company, which consolidated four small roads near Pittsburgh. All of the roads which were taken over to form this company were rehabilitated, and Mr. Newton remained with the company more than two years, or until after the properties had been reconstructed. After leaving the Beaver Valley Traction Company Mr. Newton was placed in charge of the Hartford & Springfield Street Railway. He had been with this company about nine years, and lately held the offices of secretary and general manager of the company.

OBITUARY

Joseph Le Conte Davis, engineer in charge of design of direct-current railway type motors, embracing mining and vehicle truck motors, for the Westinghouse Electric & Manufacturing Company, died in Pittsburgh on Aug. 5, 1912. Mr. Davis was graduated from the University of South Carolina in 1897 with the degree of electrical engineer. He was professor of physics at Bingham Academy High School in North Carolina from 1897 to 1900. Subsequently he entered the employ of the General Electric Company at Schenectady, N. Y., and was engaged in engineering work for this company from 1900 to 1904. Mr. Davis was also at one time in charge of the development of the National Electric Signaling Company, which embraces the Fessenden Wireless System. Since 1904 he was employed by the Westinghouse Electric & Manufacturing Company as a designing engineer in the electric railway department. His work in connection with the design of the direct-current motors used on the Pennsylvania terminal electrification and many other large installations brought Mr. Davis prominently before the engineering profession of the United States.

Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (*) indicates a project not previously reported.

RECENT INCORPORATIONS

***Mount Ida, Ouachita Valley & Hot Springs Railway, Fort Smith, Ark.**—Chartered in Arkansas to build an electric railway from a point on the Gurdon and Fort Smith road, north of Caddo Gap, to Mount Ida, a distance of 8 miles. Capital stock, $80,000. Directors: G. H. Spear, L. L. Beavers, S. T. Smith, C. J. Watkins and others. O. C. Godman, Fort Smith, Ark, is the promoter.

***Ellsworth & Washington Street Railway, Washington, D. C.**—Chartered in Pennsylvania to build an electric railway from Ellsworth to Washington, a distance of 14 miles. Capital stock, $85,000.

Washington (D. C.) Traction Company.—Chartered in Pennsylvania to build an electric railway from the Monongahela River to Washington, D. C. Capital stock, $10,000. Incorporators: Charles S. Caldwell, John W. Warrick, I. E. Paul, L. S. Vowell and Frank McKinley, all of Washington, D. C. [E. R. J., April 20, '12.]

***Central Illinois Traction Company, Canton, Ill.**—Application for a charter will be made by this company in Illinois to build an electric railway to connect Canton, Pekin, Owl's Nest Park, Peoria and Keokuk. Capital stock, $2,000. Incorporators: J. T. Adams, Columbus, Ohio; C. R. Williams, Chicago; A. L. Ralston, Grove City, Ohio; Judge W. R. Curran, Pekin; Hon. W. Ash, Canton, and Calvin G. Formahle and Bert C. Huddleson, West Fulton.

FRANCHISES

Colton, Cal.—The Pacific Electric Railway has received a franchise from the Council in Colton. This is part of the company's plan to build an extension from San Bernardino into Colton, via Colton Avenue.

San Bernardino, Cal.—The Pacific Electric Railway has received permission from the Board of Supervisors to cross all county roads between San Bernardino and Riverside.

East Lyme, Conn.—The New London & East Lyme Street Railway has received a franchise from the Council to extend its tracks from Flanders Corners to the Lyme line.

Muscatine, Ia.—J. F. Porter, of the Davenport-Muscatine Railway, has proposed to the Council of Muscatine that if the city will grant a twenty-five-year franchise the company will build an extra bridge on Osett Avenue for the use of interurban and street cars and extend the line into northwest Muscatine.

St. Martinville, La.—The Southwestern Traction & Power Company has asked the Council for a franchise in St. Martinville. This company plans to build an extension from New Iberia to St. Martinville, Breaux Bridge and Lafayette.

***St. Martinville, La.**—A. G. Barrow, New Iberia, representing the Louisiana Electric Railway & Power Company, has asked the Council for a franchise in New St. Martinville. This is part of a plan to build an electric railway from New Iberia to St. Martinville, Breaux Bridge, Lafayette, Morrisville and Abbeville. [E. R. J., May 25, '12.]

Luverne, Minn.—The Sioux Falls & Southern Minnesota Traction Company has received a franchise from the Council on condition that the railway be built within one and one-half years after the acceptance of the franchise by the company.

New York, N. Y.—The Public Service Commission, First District, has granted to the Manhattan & Jamaica Railway a certificate of convenience and necessity for a railway over the Queensboro Bridge and through Queens Borough to the city line.

New York, N. Y.—An order approving the modified franchise of the South Shore Traction Company for an electric railway over the Queensboro Bridge and through Queens

Borough to the city line, and also approving the transfer of such modified franchise from the South Shore Traction Company to the Manhattan & Jamaica Railway, has been approved by the Public Service Commission, First District.

Selina, N. Y.—The Public Service Commission, Second District, has received an application from the Syracuse Rapid Transit Company for permission to begin construction of a single track on the Syracuse & Bridgeport Railway, on the easterly line of the city of Syracuse, to the entrance of the Assumption Cemetery in Selina, and to exercise the franchise granted by that town. The franchise granted by the town provides that the company will not charge more than a 5-cent fare to persons on any point of the railway and extension authorized in the city of Syracuse and also that transfer privileges shall be accorded to travelers.

Port Arthur, Ont.—The Port Arthur & Fort William Electric Railway has asked the Council to consider plans for a route for the 6-mile belt line in Port Arthur.

Portland, Ore.—The Council has been asked to grant a franchise to the Portland Railway, Light & Power Company for an extension of the Mount Tabor line from East Sixty-ninth Street to East Eighty-eighth Street.

Salem, Ore.—The Portland, Eugene & Eastern Railway, Portland, has asked the Council for a franchise in Salem.

Charleston, S. C.—The Charleston-Summerville Electric Railway has received the indorsement of the Charleston Chamber of Commerce for the construction of its line in Charleston. The company has asked the Council for a franchise in Charleston. This line will connect Charleston and Summerville. [E. R. J., June 22, '12.]

Corpus Christi, Tex.—The Corpus Christi Street & Interurban Railway has received a franchise from the City Council for a new 10-mile line in Corpus Christi that will extend through the suburban residential section of Corpus Christi.

***Seattle, Wash.**—A resolution has been adopted by the Council in which it is stated that franchises for electric railways will be let to the highest bidder. Fifteen specified routes are included in the resolution.

TRACK AND ROADWAY

Birmingham Railway, Light & Power Company, Birmingham, Ala.—This company plans to build soon a branch of its main North Bessemer line from Brighton to Woodward.

***Little Rock, Ark.**—George R. Brown, secretary of the Little Rock Chamber of Commerce, and Eugene Langford, New York, N. Y., are said to be interested in a plan to construct an electric railway between Memphis and Pine Bluff with a possible extension to Hot Springs.

British Columbia Electric Railway, Vancouver, B. C.—Plans are being considered by this company to build an extension from Clayburn to Mission City.

Richmond, Cal.—Work will soon be begun on the construction of an electric railway at Richmond which will make a complete loop through the city and connect with the Southern Pacific Company's line. It is said that financial backing has been secured. H. C. Cutting, president of the Point Richmond Land & Canal Company, Richmond, is interested. [E. R. J., May 25, '12.]

Wilmington, New Castle & Delaware City Railway, New Castle, Del.—Preliminary arrangements are being made by this company to extend its lines in New Castle to the plant of the Lobdell Car Wheel Company in South Wilmington.

Americus, Tifton & Atlanta Railway, Tifton, Ga.—The stockholders of this company, which proposes to build a 110-mile electric railway in South Georgia from Americus to Milltown by way of Oakfield, Doles, Ashburn, Tifton and Nashville, with an ultimate view to making Jacksonville, Fla., the southern terminus, has organized by electing the following officers: I. W. Myers, Tifton, president; J. S. Shingler, Ashburn, and L. G. Council, Americus, vice-presidents; John W. Greer, Tifton, secretary, and Fullwood & Skeen, Tifton, general counsel. [E. R. J., July 6, '12.]

Chicago, Peoria & Quincy Traction Company, Chicago, Ill.—This company has completed its preliminary surveys between Peoria and Rushville, Ill., and has prepared complete estimates, profiles and maps of this section of the line. It is understood that trolley service will be used ultimately, but gasoline electric traction will be the initial motive power pending completion of the line.

La Salle County Electric Railway, Chicago, Ill.—Work has been begun by this company on the first section of its line between Ottawa and Mendota. A branch will be built from Prairie Center to Earlville and the line ultimately extended from Earlville to Leland, Somonauk and Sandwich and north to Syracuse. George H. Dodge, Chicago, president. [E. R. J., May 11, '12.]

Springfield & Northwestern Railway, Springfield, Ill.—This company, which plans to build an electric railway between Springfield and Mason City, has notified the city of Springfield that it proposes to build a subway 66 ft. wide under the tracks of the Chicago & Alton Railroad, to widen the street 8 ft., to do the necessary paving, to furnish city service on cars and to pay to the municipality $2,000 a year until the company shops are located in Springfield.

Evansville, Chrisney & Eastern Railway, Evansville, Ind.—Construction will be begun by this company about Sept. 1 on its line between Boonville, Chrisney and Evansville. J. P. Christney, president. [E. R. J., June 8, '12.]

Cincinnati, Louisville, Lexington & Maysville Traction Company, Dry Ridge, Ky.—This company has completed its line between Dry Ridge and Owenton, Ky., and it is expected that the line between Covington and Maysville will be in operation in the course of a year. The entire right-of-way between Covington and Dry Ridge has been surveyed and construction stakes have been placed, so that the construction of the eastern division of the electric railway which will connect Cincinnati, Ohio, and Louisville, Ky., is a matter of the immediate future.

Frankfort & Shelbyville Realty Company, Frankfort, Ky.—This company has obtained the right-of-way and will begin the construction as soon as it can obtain financial backing for its 21-mile railway between Frankfort and Shelbyville. Officers: E. H. Taylor, Jr., Frankfort, president; R. D. Armstrong, vice-president; Eli H. Brown, Frankfort, secretary; Kenner Taylor, treasurer, and Loran Cox, Taylorsville, chief engineer. [E. R. J., July 20, '12.]

Evansville, Henderson & Owensboro Railway, Henderson, Ky.—This company has begun a survey of an extension of its Owensboro line through Hebbardsville and Zion. The line is to be built, according to present plans, immediately after the first of the year 1913. [E. R. J., June 22, '12.]

Kentucky Southwestern Interurban Railway, Light & Power Company, Hickman, Ky.—Surveys have been made by this company on its line from Mayfield to Fancy Farm, a distance of 8 miles. This action completes the survey of routes for various lines of the company and the actual erection of grades and trackage will follow at once. [E. R. J., July 13, '12.]

Maysville Street Railroad & Transfer Company, Maysville, Ky.—An extension of the lines of this company is being made from the present western terminus of its properties. The company is rebuilding the overhead work of part of the Maysville lines.

Berkshire Street Railway, Pittsfield, Mass.—Surveys have been made and work will soon be begun by this company on its extension up Mount Greylock.

Muskegon & Manistee Interurban Railway, Muskegon, Mich.—It is said that Chicago capitalists will build this railway between Muskegon and Manistee, provided the residents of the towns and districts will subscribe for $100,000 worth of stock. Power will be secured from the Grand Rapids-Muskegon Power Company. Herman O'Connor, Holton, is interested. [E. R. J., June 22, '12.]

Hattiesburg (Miss.) Traction Company.—This company has filed a mortgage for $2,500,000 to cover an issue of bonds of the same amount, a part of which, it is reported, will be used to make extensive improvements of its lines in Hattiesburg.

Kansas City & Fort Scott Electric Railway, Kansas City, Mo.—The directors of this company announce that they have obtained sufficient right of way to insure the construction of the road.

Coney Island & Brooklyn Railroad, Brooklyn, N. Y.—This company has been served with an order by the Public Service Commission, First District, directing it to remove and replace, with suitable new rails throughout, all of its double-track street railway on Wythe Avenue between Flushing Avenue and Taylor Street, Brooklyn. The company is ordered to begin the work of rebuilding not later than Aug. 15 and to complete the same as soon as practicable, but not later than Nov. 1, 1912.

***Ithaca, N. Y.**—Philadelphia and Allentown capitalists are planning to construct a 28-mile electric railway between Ithaca and Portland, N. Y. Elias Chandler, Atlantic City, and Howard Chandler, Philadelphia, are interested in the proposition.

Sauquoit Valley Electric Railway, Utica, N. Y.—This company has been organized, the right-of-way secured and the necessary capital obtained for the construction of its line between New Hartford and Clayville. Application will be made to the State Public Service Commission, Second District, for permission to construct the line. The H. C. Bentley Company, New York City, is promoting the project. [E. R. J., May 18, '12.]

Cincinnati (Ohio) Traction Company.—This company plans to build a new line in Price Hill.

Columbus, New Albany & Johnstown Traction Company, Columbus, Ohio.—Plans are being made by this company to extend its line from its present terminus at Gahanna to Wooster.

Columbus Railway & Light Company, Columbus, Ohio.—This company will extend its double track on Cleveland Avenue from the city line to the north corporation line of Linden Heights.

Ardmore, Duncan & Lawton Railway, Ardmore, Okla.—Work has been begun by this company on its line to Sherman. J. L. Hamon, president. [E. R. J., March 23, '12.]

Muskogee (Okla.) Electric Traction Company.—Work has been begun by this company on its Elgin Avenue line in Muskogee.

London (Ont.) Street Railway.—Improvements are proposed by this company, which will include the construction of additional lines in London.

Ottawa, Smith's Falls & Kingston Railway, Ottawa, Ont.—Surveys will be begun at once by this company for a branch from Lombardy through Perth to Lanark. The municipalities will pay the cost of the surveys. [E. R. J., Feb. 10, '12.]

Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont.—The Minister of Railways has approved a route map of a line from Port Dalhousie to Beamsville, Ont., about 12 miles. The map shows a line which branches from the present line and proceeds along Lake Ontario to Jordan, thence to Beamsville, where it will connect with the Hamilton, Grimsby & Beamsville Electric Railway.

Sandwich, Windsor & Amherstburg Railway, Windsor, Ont.—This company will double-track its lines on Sandwich Street, Windsor, and pave the space between rails.

Oregon Electric Railway, Portland, Ore.—This company will place in operation its line into Eugene on Oct. 15.

Portland, Eugene & Eastern Railway, Portland, Ore.—Plans are being considered by this company to build an extension between Eugene and Creswell.

West Side Electric Railway, Charleroi, Pa.—Work has been begun by this company on its line through Bentleyville to Ellsworth.

Pittsburgh (Pa.) Railways.—Plans are being considered by this company to build a belt line in Pittsburgh from the Atwood Street district through to a connection with cars running through Squirrel Hill to give access to the interior of Schenley Park.

Montreal (Que.) Tramways.—Plans are being made by this company to double track its line to Bout de l'Ile. E. A. Robert, president.

Chattanooga Railway & Light Company, Chattanooga, Tenn.—Plans have been prepared by this company for the construction of double-track interurban lines from the Western & Atlantic Railway crossing, near Chattanooga, to the Citico switch, a distance of 1½ miles. This work will be begun in the immediate future.

Nashville Railway & Light Company, Nashville, Tenn.—This company plans to build soon extensions to its city lines and to erect a new bridge.

Beaumont-Port Arthur Interurban Electric Railway, Beaumont, Tex.—The Stone & Webster Engineering Corporation is making surveys for this interurban railway between Beaumont and Port Arthur. [E. R. J., Dec. 3, '12.]

Bryan & College Interurban Railway, Bryan, Tex.—Plans are being made by this company to extend its line through Bryan and out to Allen Academy.

Washington-Oregon Corporation, Vancouver, Wash.—Right-of-way has been obtained and work will soon be begun by this company on a line from Sifton to Camas, a distance of 12 miles. Arrangements are also being made to extend the line from Sifton to Hockinson, 6 miles distant.

***Walla Walla, Wash.**—W. A. Terrell, Union, and others are interested in a plan to build an electric railway between Walla Walla, Wash., and Union, Ore.

Morgantown and Dunkard Valley Railroad, Morgantown, W. Va.—Contracts have been awarded by this company for the construction of 10 miles of new line from Cassville to Pentress.

SHOPS AND BUILDINGS

Washington Railway & Electric Company, Washington, D. C.—This company has placed an order with the Upton-Smoot Construction Company for the construction of additional car storage sheds at Four and a Half and O Streets, S.W., Washington, D. C.

Des Moines (Ia.) City Railway.—Plans are being made by this company to begin the construction of its new carhouse in Des Moines. The structure will be one-story, 211 ft. x 183 ft., and of brick construction. The cost is estimated to be about $50,000.

Winnipeg (Man.) Electric Railway.—A permit has been granted to the Winnipeg Electric Railway to erect a fourteen-story building to cost $500,000 at Notre Dame and Albert Streets, Winnipeg. Pratt & Ross are the architects. The contract for construction has been let to the Carter, Halls, Adlinger Company, Winnipeg.

United Railways & Electric Company, Baltimore, Md.—Plans are being made by this company for the construction of new carhouses on Hartford Road, adjoining Weber's Park, Baltimore. The structure will be of concrete, brick and stone with slag roof. The cost will be about $150,000.

Third Avenue Railroad, New York, N. Y.—This company plans to build on the roof of its carhouse on the north side of 216th Street, 250 ft. east of Tenth Avenue, a steel tower 125.4 ft. high and 35 ft. in diameter and having a capacity of 50,000 gal. The Des Moines Bridge & Iron Company is the builder.

Greenville, Spartanburg & Anderson Railway, Anderson, S. C.—A new freight depot and yards and a new passenger pavilion will be erected by this company in Williamston in the near future.

POWER HOUSES AND SUBSTATIONS

Georgia Railway & Electric Company, Atlanta, Ga.—This company, which is developing the electric power at Tallulah Falls, will build in Atlanta a new substation, the contract for which has been awarded to the Mackle-Crawford Construction Company. The plant will consist of several buildings. The main structure will be three stories, 40 ft. x 80 ft., and of brick, concrete and steel construction.

Aurora, Elgin & Chicago Railroad, Chicago, Ill.—Bids are being asked by this company to build a new substation at Batavia. The structure will be one-story, 70 ft. x 80 ft., and of brick, tile and concrete construction.

Jamestown (N. Y.) Street Railway.—The power house of this company was damaged to the extent of $25,000 in a fire which occurred on Aug. 10, as noted on page 216 of this issue of the ELECTRIC RAILWAY JOURNAL.

Pacific Northwestern Traction Company, Seattle, Wash.—This company has arranged with the Stone & Webster Engineering Corporation, White Building, Seattle, for the construction of six new substations near Seattle.

Manufactures and Supplies

ROLLING STOCK

Phoenix (Ariz.) Railway will probably purchase a few cars in the fall.

Southern Iowa Traction Company, Centerville, Ia., is reported to be in the market for several cars. W. A. Boland, president.

Cleveland (Ohio) Railway has ordered one center-entrance car of the Brooklyn type from the G. C. Kuhlman Car Company.

Memphis (Tenn.) Street Railway has ordered from The J. G. Brill Company fifteen 38-ft. 3¾-in. center-entrance closed trailer bodies mounted on Brill 53-D trail trucks.

Charleston Consolidated Railway & Lighting Company, Charleston, S. C., has ordered five cars from the Cincinnati Car Company. They will be equipped with Brill 21-E trucks.

New York State Railways, Rochester Lines, Rochester, N. Y., is having built a center-entrance car of the Brooklyn type which was described in the ELECTRIC RAILWAY JOURNAL of June 22, 1912.

Oregon Electric Railway, Portland, Ore., has ordered twenty-five coaches and six combination passenger and baggage cars from the American Car Company. The specifications for this equipment include the following:

Length over buffer, 58 ft. 4½ in.	Air brakes ....Westinghouse
	Motors .....G. E.
Interior trimming..mahogany	Trucks ..... Baldwin
Headlining .....agasote	Seats.....H. & K.

TRADE NOTES

McKeen Motor Car Company, Omaha, Neb., has shipped a 55-ft. motor car, under its own power, to Texas City, Tex., where it will be operated by the Texas City Terminal Company.

Westinghouse Traction Brake Company, Pittsburgh, Pa., has received an order from the Capital Traction Company, Washington, D. C., for 233 straight air-brake equipments to equip all the cars which are not equipped with air brakes.

Hatman & Godfrey, Kansas City, Mo., have opened an office in the Midland Building, Kansas City, for consulting work, specializing in mechanical, electrical and illuminating engineering. The members of the firm are J. G. Hatman, F. O. Godfrey and E. M. Ruede.

National Steel Car Company, Montreal, Que., is now erecting its car-building plant at Hamilton, Ont. The plant will have a capacity of thirty cars a day and will be in operation in December of this year. The headquarters of the company are in Montreal.

Rudolph Brake Company, Paducah, Ky., has been incorporated with a capital stock of $10,000 by R. E. Rudolph, Charles K. Wheeler, H. B. Sewall and J. W. McNeely. The company owns the patents upon a hand brake for electric cars which was invented several years ago by R. E. Rudolph.

Dabney H. Maury, Chicago, Ill., has established an office as consulting engineer at 1137 Monadnock Block, Chicago. He will make a specialty of reports on, and design and superintendence of, waterworks, sewerage, lighting and power plants, and also of appraisal and adjustment of rates of public utilities. Douglas A. Graham will be associated with him as principal assistant engineer.

The J. G. Brill Company, Philadelphia, Pa., has received the following orders for trucks: Cincinnati Car Company, for Cincinnati Traction Company, sixty Brill 39-E trucks; Cincinnati Car Company, for Lancaster Traction Company, two Brill 22 special trucks; Cleveland (Ohio) Railway, sixteen Brill 27-FE-1 trucks; Charleston Consolidated Railway & Light Company, five Brill 21E trucks. The company has also received an order from the International Motor Company, New York, N. Y., for one 18-ft. 6-in. omnibus motor body.

Titanium Alloy Manufacturing Company, Pittsburgh, Pa., directs attention to the output of titanium steel for the year 1911. According to statistics compiled by the American Iron & Steel Association, the total production was 402,808 gross tons and comprised 252,540 tons of titanium open-hearth and crucible steel and 150,546 tons of titanium Bessemer steel. This was a considerable increase over the output of 1910 and shows a remarkable gain for titanium steel, inasmuch as the production of steel castings decreased 31.2 per cent from the output of the previous year. During the same period the output of electric steel decreased 22,936 tons from the figures of 1910. This shows the immense gains in the consumption of titanium as a deoxidizer.

Columbus Machine & Tool Company, Columbus, Ohio, has placed contracts for the construction of a manufacturing plant in Columbus. The company was incorporated in June with a capital stock of $500,000. Since its incorporation, the new company has purchased the business of the Columbus Machine Company, Columbus, Ohio, and that of the Vulcan Furnace Company, Warren, Ohio. Gas, gasoline and oil engines up to 600 hp, mechanical stokers, shaking grates, pipe machines, bolt machines and piston machines, etc., will be manufactured by the company. Orders for machine-tool and power equipment have not yet been placed. Pending completion of the new plant, manufacturing is being conducted in the plant of the Columbus Machine Company. D. H. Palmer is president and general manager of the company.

ADVERTISING LITERATURE

National Lock Washer Company, Chicago, Ill., has issued a 24-page catalog which describes and illustrates its complete line of car curtains, curtain fixtures, sash locks, sash balances and lock washers.

Allgemeine Elektricitäts-Gesellschaft, Berlin, Germany, has published a pamphlet in German describing its street railway motor U 53. This is a non-interpole machine built for 500-volt service and rated at 36 hp.

O. J. Childs Company, Utica, N. Y., has issued a 20-page catalog which fully describes and illustrates a complete line of the Utica and Childs hand extinguishers, also various types of Utica copper tank chemical engines.

Indianapolis Brass Company, Indianapolis, Ind., has issued a circular which describes the I. B. C. protective and reclaiming pole sleeve. Another circular describes two types of section insulators manufactured by the company.

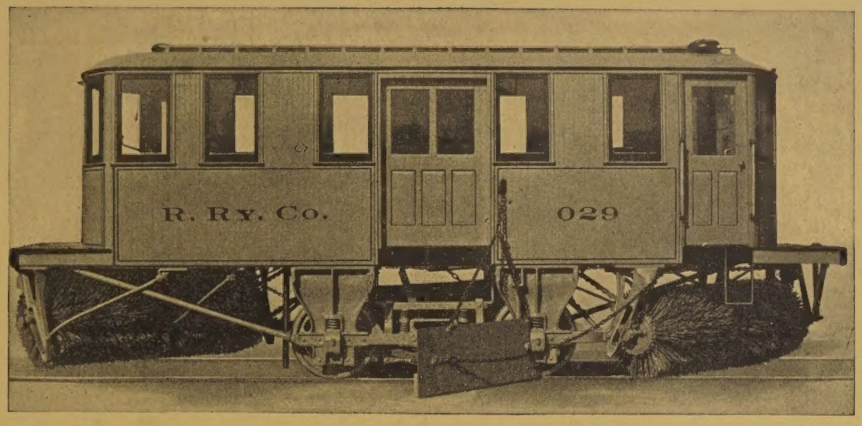
Western Electric Company, New York, N. Y., has issued catalog bulletin No. 74 on line construction material, which replaces catalog bulletin No. 9780. The new bulletin contains detailed information on woodwork and hardware of all classes of overhead construction. Fiber conduit and furnishings are also described in this bulletin.

Indianapolis Brush & Broom Company, Indianapolis, Ind., has issued a forty-page catalog which describes and illustrates the various kinds of brushes and brooms manufactured by the company. Particular attention is called to the Capital rattan snow and switch broom, bamboo snow broom and the double band snow and switch broom which are used by many railways.

Trolley Supply Company, Canton, Ohio, has issued a bulletin which describes and illustrates two types of its pressed steel dash headlights. No. 14 is to be set in dash and No. 15 is to be screwed to outside of dash. This headlight consists of practically only two parts, the door and back reflector case, reflector and back case being stamped in one piece. The company is also mailing a circular which calls attention to the merits of five of its specialties, viz., Peerless No. 10 trolley base, Peerless check valve, Peerless, Jr., headlight, Knutson trolley retriever No. 5 and Ideal trolley catcher.

General Electric Company, Schenectady, N. Y., has issued a 132-page catalog devoted to the use of the higher voltages in the operation of direct-current electric railways. The bulletin sets forth the advantages of the higher voltages in this connection. It contains numerous tables which give the various costs of 1200-volt systems as compared with those of 600 volts, illustrates and describes station and car equipments and locomotives for railroads of higher direct-current voltages, and describes the various systems employing direct current at 1200, 1500 and 2400 volts. The bulletin contains a large amount of information of interest and value to electric railway operators.

BRILL CITY AND INTERURBAN CARS AND TRUCKS BRILL



Take George Washington's Advice

about preparing for war. Don't let the first snow storm catch you unprepared. Even Brill facilities are sometimes taxed to make prompt deliveries on snow sweeper orders rushed in at the last minute. Take up the question now.

There are two types of Brill Standard Snow Sweepers —the long broom sweeper with brooms extending 14 inches outside the truck on each side, and the short broom type, a lighter machine requiring less power.

Both are simple, effective machines, powerfully built for fast work and hard usage.

Brill Snow Plows for the deep-snow belt have made good for years. Four-wheel nose plows, four-wheel shear plows, double-truck nose plows, double-truck shear plows, double-truck nose plows with folding shear-board for double track service, detachable shear plows—these are standard types. Brill Track Scrapers save bringing out sweepers for light snows, save traction during heavy storms, save money everywhere.

Snow sweepers and plows of special form to meet unusual conditions will be designed or built to your own designs.

The Brill Snow Sweeper and Plow Catalog is ready.

THE J. G. BRILL COMPANY
Philadelphia, Pa.

G. C. KUHLMAN COMPANY
Cleveland, Ohio

AMERICAN CAR COMPANY
St. Louis, Mo.

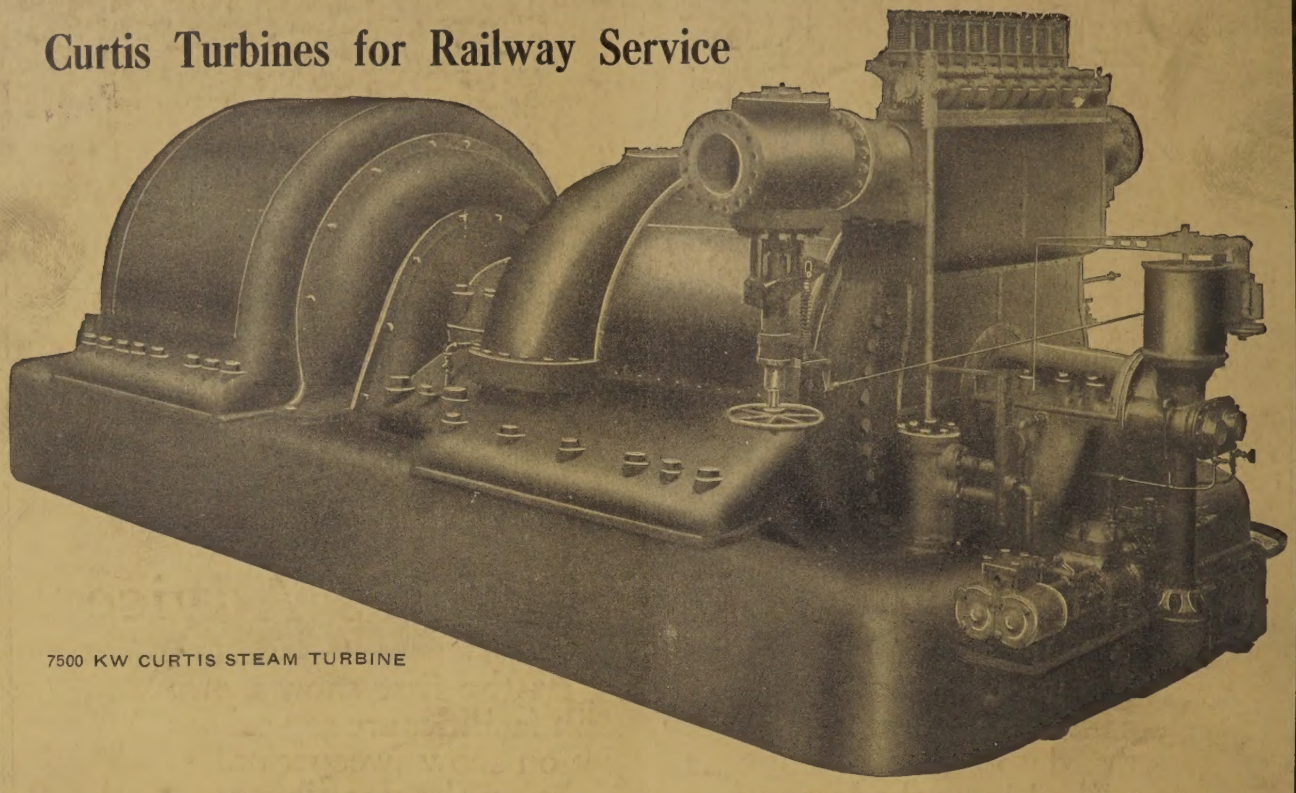
WASON MANUFACTURING COMPANY
Springfield, Mass.

JOHN STEPHENSON COMPANY
Elizabeth, N. J.

COMPAGNIE J. G. BRILL
Paris, France

BRILL THE J.G.BRILL COMPANY, PHILADELPHIA BRILL

Curtis Turbines for Railway Service



7500 KW CURTIS STEAM TURBINE

Continuous and Economical Car Service is largely dependent upon Power House Efficiency

Railway steam power plants using Curtis turbines find them particularly well adapted to the service because:

1. **Curtis Turbines** are characterized by high economy over a wide range of load.

2. **Curtis Turbines,** due to their rugged internal construction, safely withstand the severe demands of rapidly fluctuating loads.

3. **Curtis Turbines** derive the maximum advantage from high steam pressure and high vacuum.

4. **Curtis Turbines,** due to ample running clearances, are not subject to the danger of contact between moving and stationary parts.

5. **Curtis Turbines** are constructed to withstand sudden changes of temperature, incident to quick starting, or to variations in superheat while running.

6. **Curtis Turbines** drive generators designed and built by the largest electrical manufacturer in the world, based on years of experience with all classes of electrical apparatus.

General Electric Company

Largest Electrical Manufacturer in the World

General Office: Schenectady, N. Y.

ADDRESS NEAREST OFFICE

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boise, Idaho
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Davenport, Iowa
Dayton, Ohio
Denver, Colo.
Detroit, Mich. (Office of Agent)
Erie, Pa.
Indianapolis, Ind.
Kansas City, Mo.
Keokuk, Iowa
Knoxville, Tenn.
Los Angeles, Cal.
Louisville, Ky.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Nashville, Tenn.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Pittsburg, Pa.
Portland, Ore.
Providence, R. I.
Richmond, Va.
Rochester, N. Y.
Salt Lake City, Utah
San Francisco, Cal.
St. Louis, Mo.
Schenectady, N. Y.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Youngstown, Ohio

3744